John Crawford,

M. D.

MEDICAL FACTS

AND

OBSERVATIONS.

VOL. VI.

MEDICAL FACTS

AND

OBSERVATIONS.

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MEDICAL FACTS

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OBSERVATIONS.

I. *Observations on the Use of Arsenic in the Intermittent Fevers of a tropical Climate; to which is prefixed an Account of the Weather, at Sierra Leone, during the Season in which such Fevers are most prevalent.* *By* Thomas Masterman Winterbottom, *M. D. Physician to the Settlement at Sierra Leone.*

AS arsenic, though of late years frequently and successfully used in England for the cure of intermittent fevers, has not, to my knowledge, been hitherto employed in a tropical climate; some account of its use in Africa, with the histories of a few of the cases in which it was exhibited, will not, I hope, be altogether unacceptable.

It may be proper however to premiſe a ſhort account of the weather at Sierra Leone during the ſeaſon in which intermittents are moſt prevalent.

The year may be divided into the rainy, tornado, and dry ſeaſons. The rains on this part of the coaſt commonly ſet in about the end of May, or beginning of June; and continue, more or leſs violently, until the beginning or middle of September: they are then ſucceeded by tornadoes, which continue until the end of November. It muſt be obſerved, however, that the rains are not only carried off by tornadoes, but alſo brought on by them; and that the tornadoes preceding the rains are, in general, leſs regular than thoſe which terminate them. The dry ſeaſon continues from December until May, though ſhowers of rain ſometimes occur during the dry months.

In 1792, the rains commenced about the end of May, and continued for ſome time to be very heavy; from the middle of July, however, until the laſt week of Auguſt, there were frequent intervals of fair weather, twelve hours of rain being generally followed by twenty-four or thirty hours of fair weather, with ſometimes a bright ſun. During this period the thermometer at noon uſually ſtood at from 78° to 80°.

The

The laſt week of Auguſt and firſt week of September were remarkable for an almoſt inceſſant rain, which was for the moſt part ſmall and drizzly, though it ſometimes fell in heavy ſhowers; the air at the ſame time felt cold and raw, particularly in the evenings and mornings, when a thick fog covered the hills. The thermometer at noon was from 77° to 80°.

On the 7th of September a tornado came on, which returned on the 10th, 15th, 16th, 18th, 19th, 21ſt, 22d, 24th, 26th, 28th, and 30th.

On the 8th, 11th, 12th, 25th, and 29th, the ſhowers of rain were frequent.

On the 9th, 11th, 14th, and 23d, thunder and lightning occurred during ſome part of the day. The 9th, 13th, 15th, 17th, 24th, and 26th were ſultry and almoſt calm. During the continuance of the rains, the winds chiefly blew from between the ſouth and weſt points, but moſt frequently from the ſouth-weſt, whence alſo the heavieſt rain came.

As ſoon as the tornadoes appeared, the ſea and land breezes had a more regular ſucceſſion; the ſea breeze uſually began from the north-weſt about eight or nine A. M., and towards ſunſet drew round to the weſt: the land breeze then ſetting in from the eaſt or ſouth-eaſt, con-

tinued to blow all night and during the early part of the morning.

Towards the end of the month the thermometer generally ſtood at 82° at noon, the atmoſphere being leſs hazy, and the air cool.

The month of October was throughout attended with regular ſea and land breezes; the atmoſphere was free from haze, but ſometimes overcaſt with clouds during the day; the whole of the month was cool and agreeable, though the thermometer at noon generally ſtood at 82°, and on the 29th at 84°.

A tornado occurred every night, or early in the morning, from the 1ſt to the 18th inclusively, frequently attended with heavy rain for ſome hours, and with much thunder and lightning. During the remainder of the month the tornadoes became leſs frequent, occurring only on the 19th, 21ſt, 23d, 25th, 27th, 28th, and 29th. The 1ſt, 17th, and 24th were ſultry. On the 24th it was calm all day. On the 3d there was much thunder and lightning. On the 7th, 15th, 18th, 21ſt, and 30th, frequent ſhowers of rain fell. The tornado on the 17th came from the ſouth-weſt which is uncommon. The tornado on the 2d was not followed by rain. The 26th was remarkably hazy all day.

The

The lightning was extremely vivid on the 28th, appearing in long ſtreams or chains of fire.

The month of November was much warmer than the preceding one, the thermometer at noon being from 82° to 84°. On the 11th it roſe to 85°. It was on the 5th at 75°. There was continued rain till noon, when the ſky became clear, the day calm and ſultry. The atmoſphere during the greateſt part of the month was clouded and hazy, at leaſt the tops of the hills were covered with haze during ſome part of the day. The ſea and land breezes continued to blow very freſh, but the mornings were frequently calm and ſultry till near ten A. M. On the 28th it was calm all day. Tornadoes occurred on the 2d, 8th, 10th, 12th, 13th, 16th, 19th, and 25th. The 5th, 17th, and 23d were rainy. The 5th, 11th, 14th, 18th, and 28th, were ſultry, with a little wind.

In December alſo the ſky was generally hazy and clouded; the ſea and land breezes were pretty freſh during their continuance, but the mornings were for the moſt part calm, the ſea breeze not ſetting in till near ten A. M.; the evenings alſo were cloſe and ſultry from ſun-ſet till late at night.

A tornado came on, the morning of the 7th,

followed by much rain, thunder, and lightning; but it cleared up before noon; a heavy ſhower fell in the afternoon of the ſame day.

The cleareſt days this month were the 3d, 9th, 13th, 18th, 24th, and 25th.

On the 5th, 8th, 14th, 15th, and 22d, gentle ſhowers fell: on the 8th there was much thunder and lightning. The weather was ſultry, with little wind, on the 1ſt, 3d, 14th, 19th, 22d, and 27th. The 14th and 27th were calm days. The land wind blew all day on the 13th, and the ſouth-weſt and ſouth-ſouth weſt winds on the 2d, 30th, and 31ſt days. The thermometer at eight A. M. uſually ſtood at from 77° to 80°; on the 13th at 75°, and on the 26th at 81°: at noon it was from 81° to 84°; at eight P. M. from 78° to 80°.

The remittent fever which during the months of June, July, and Auguſt, had very generally prevailed here, and had raged with great violence, began to abate in the month of September. Early in the month, this diſeaſe had not only become leſs frequent, but alſo more mild in its ſymptoms, gradually changing into the form of an intermittent. Towards the end of the month it became very rare, the caſes which occurred being chiefly among the whites, eſpecially

pecially thoſe lately arrived in the country; or others who had been irregular and intemperate during the courſe of preceding intermittent complaints.

In the months of October, November, and December, intermittents were ſo prevalent, that ſcarcely a family in the ſettlement, although the whole number was nearly 400, remained perfectly free from them. They generally obſerved the quotidian and tertian type; there were, however, a few inſtances of double tertians. Moſt of the above caſes were ſo mild, particularly among the men, as not to prevent them from following their different occupations, except during the time of the paroxyſm. But in ſome inſtances, the daily recurrence of the diſeaſe, the long continuance of the paroxyſm, and a poor diet, conſiſting chiefly of ſalted meats, rice, caſſada, &c. reduced the patients to a ſtate of great debility, and inſenſibly laid the foundation of long and tedious complaints. The greateſt ſufferers from intermittents were thoſe who had previouſly laboured under remittent fevers, and had not yet recovered their ſtrength; alſo perſons of delicate and irritable habits, children, and women giving ſuck.

In every inſtance where the bark was taken

in due quantities, and perſiſted in for a proper length of time, the paroxyſm was ſpeedily checked, and the danger of a relapſe effectually prevented; nor did the patient ſuffer thoſe ill effects which uſually occur where the diſeaſe has continued long, and been left to itſelf. Few, however, of the common people could be prevailed upon to take the bark in any form; and even thoſe who took enough of it to obviate the return of a ſingle paroxyſm, would ſeldom continue it a ſufficient length of time to eradicate the diſeaſe. Theſe conſiderations, joined to an apprehenſion that ſerious and alarming conſequences might enſue from frequent relapſes, determined me to try the effects of the mineral ſolution, according to the plan recommended by Dr. Fowler *. The fear of diſordering the bowels, and inducing dyſenteric ſymptoms, rendered me at firſt very cautious in its uſe; but on finding, after repeated trials, that no ill effects were produced by its exhibition, I was encouraged to employ it more generally. The ſucceſs with which it was attended will appear from the following detail of caſes:

* Medical Reports of the Effects of Arſenic in the Cure of Agues, &c. 8vo. London, 1786.

CASE

CASE I.

October 4.—S. Peters, a black, aged four years, is affected every day, about noon, with coldneſs and violent ſhiverings, which continue near an hour, and are then ſucceeded by a hot dry ſkin, head-ach, and ſometimes vomiting. The paroxyſm is terminated in the evening by a copious perſpiration. In the abſence of the fit he makes no complaint, but appears languid and weak, and has little appetite. A conſiderable degree of hardneſs is felt on the left ſide, with a tumour projecting below the cartilages of the falſe ribs. He was ordered to take four drops of the mineral ſolution three times a day.

5. Had no cold fit yeſterday at the uſual time, but appeared heavy and uneaſy; no ſickneſs or griping was occaſioned by the drops.

8. Has had no return of the paroxyſm ſince the 3d. No griping nor any ſenſible effect has been produced by the medicine.

The ſolution was now omitted, and he took, on the 9th, four grains of calomel. This child had no relapſe, and has continued ſince to enjoy

enjoy good health, although the tumour in the ſide did not wholly diſappear till the beginning of the year 1793.

CASE II.

October 4.—Hannah Peters, a black, aged thirty-ſix years, has been for two months paſt affected with an intermittent fever; at preſent a paroxyſm comes on every day at noon. During the hot fit, ſhe has a conſiderable pain of the head, eſpecially over the eyes, which continues till evening, and is gradually abated by the ſweat which then breaks out. Her ſtrength and appetite are much diminiſhed.

Capiat ſolutionis mineralis guttas x. ter die.

6. Had no return of fever yeſterday at the uſual time; but towards evening had a ſlight cold fit, ſucceeded by heat and ſweating. The paroxyſm, however, was neither ſo ſevere, nor of ſo long continuance as uſual. She felt a little griping in her bowels.

Repetatur Solutio.

8. Has omitted the ſolution two days, and has had a return of the hot fit each day at the uſual time, without the preceding cold ſtage. She was deſired to continue the drops regularly.

16. Has

16. Has taken the ſolution regularly ſince the laſt report, during which time ſhe has not had the leaſt return of her ague, nor any pain of the bowels.

Omittatur ſolutio et capiat Infus. Cort. Anguſt. ℥iij ter die.

CASE III.

October 10.—David Edmonds, a black, aged forty years, has had every day, for near a month paſt, a paroxyſm of ague, attended with a very ſevere pain of the head. Of late the fit has only returned every ſecond day, beginning about one o'clock, P. M. In the abſence of the paroxyſm he has no complaint but languor and debility.

Capiat ſolut. min. guttas x. ter die.

11. Had a ſlight attack yeſterday evening, which did not continue long; he felt no griping or nauſea from the ſolution.

Repetatur Solutio.

16. Has neglected his medicine for ſome days, during which he has miſſed the cold fit, but had a pretty ſmart hot fit every day, towards evening.

Repetatur Solutio.

20. Has had no return of the cold or hot fit ſince

ſince the 16th: he continues the ſolution without experiencing any diſagreeable effect from it.

CASE IV.

Octob. 5.—J. Barnes, aged thirty-ſix years, of a fair complexion, and florid, with red hair, was attacked with the remittent fever about the end of Auguſt laſt, from which he recovered by a liberal uſe of the bark; but ſoon after, on returning to work, and expoſing himſelf too much in the ſun, he ſuffered a ſevere relapſe in the beginning of September. His complaint, however, yielded again to the bark, but left him greatly enfeebled. During the remainder of the month of September, he continued to take from ʒi to ʒiſs of bark every day, and returned to his work. About a week afterwards he was ſuddenly ſeized with a cold fit, followed by a hot ſtage and a profuſe perſpiration, which left him very weak during the apyrexia. His pulſe is now 100, rather hard and quick: he has a ſevere attack every day at noon, attended with vomiting, and, during the hot fit, with a quick and hurried reſpiration; he is hot

and

and reſtleſs till late in the evening, and has then very profuſe night ſweats.

Capiat ſolut. min. guttas x. ter die.

Oct. 6. The ſolution did not diſagree with him. He had a ſlight return of the paroxyſm yeſterday.

Repetatur Solutio.

8. Has had no return of the fit, nor felt any ſenſible effect from the medicine. He perſpired much at night; has great debility and languor, with little appetite.

10. The ſymptoms are nearly as before; he did not reſt well, but had no return of the paroxyſm.

Capiat opii gr. ij h. s. Repetatur Solutio.

12 The ſolution was yeſterday omitted; he reſted better with the pill: in other reſpects finds no alteration.

13. Had a return of the paroxyſm yeſterday; the cold ſtage laſted half an hour, the hot ſtage about two hours. He was much relieved by the opium, and ſweated very profuſely after it.

14. Had another ſlight fit yeſterday evening, the cold ſtage being very ſhort; he ſweated much: does not recover his ſtrength or appetite. As he could not be prevailed upon to take the bark again, I directed that four ounces of the following

following infuſion ſhould be taken three times a day:

℞. Corticis Anguſturæ ℥j Cremor. Tart. ʒij Aquæ pur. ℔ij ſſ.

By this plan his appetite became better, and he regained his ſtrength in ſome degree; but in a week or ten days he relapſed into his former ſtate, having every day an ague fit, which was, however, relieved by two grains of opium, taken at the commencement of the cold ſtage. He now began to take the bark to the amount of ʒiſs a day, which finally put a ſtop to the ague; notwithſtanding, he recovered his ſtrength ſo ſlowly, that it was thought neceſſary, ſix weeks afterward, to ſend him to England for the effectual reſtoration of his health.

CASE V.

October 14.—A. Richardſon, a black, aged forty years, ſince her recovery from a remittent fever in Auguſt laſt, has continued in a very debilitated ſtate, and for ſome time paſt has been affected with an intermittent fever, the cold fit of which comes on daily at four o'clock, P. M. is very ſevere, and of long duration.

Much

Much pain of the head, and frequent vomiting attend the hot fit, which continues the greateſt part of the night, and is ſucceeded towards morning by a ſlight partial ſweat: ſhe remains very weak till the commencement of the next paroxyſm; her appetite is much impaired; her body open.

Capiat ſolut. min. guttas x. ter die.

16. Has taken the ſolution two days, and has had no appearance of the ague, except a little uneaſineſs and yawning about the time of its uſual attack. No ſenſible effect is produced by the medicine.

Repetatur Solutio.

17. Had a return of the paroxyſm yeſterday; the cold fit was ſhort, but ſevere; the hot fit was alſo violent, and terminated by a profuſe perſpiration; after which, however, ſhe appeared more eaſy and compoſed than uſual. She complained of no griping or nauſea from the medicine.

Repetatur Solutio.

24. Has had no return of the paroxyſm ſince the 17th, nor any ſymptoms of its approach. She continues ſtill very weak, and has little appetite.

Omittatur ſolut. Capiat infuſ. gent. c. ℥ij ter die.

28. Has had no return of the fit. She begins

gins to recover her ſtrength and appetite.

Repetatur Infuſ.

CASE VI.

Nov. 2.—Mary Bowler, aged forty years, a black, has been for ſix weeks affected with a tertian ague; the cold fit is ſevere; the hot fit, which is very violent, and attended with great pain of the head, generally continues all night, and ſometimes part of the next day, without any ſweating ſtage. She is much debilitated, but has a tolerable appetite.

Capiat ſolut. min. guttas x. ter die.

4. Had a return of the paroxyſm yeſterday, after the third doſe of the ſolution. The fit returned at the uſual period, and in the ſame manner as before. No ſenſible effect was produced by the medicine.

Repetatur Solutio.

8. Has had no return of the cold fit ſince the 3d; the hot fit occurred about the uſual time, but it was ſhorter and much leſs ſevere than ordinary.

Repetatur Solutio.

12. Has had no return of the paroxyſm; ſhe complains of a little griping in her bowels, and continues ſtill weak.

Omittatur ſolut. min. Capiat inf. gent. c. ℥ij ter die.

20. She makes no complaint, and has nearly recovered her health and ſpirits.

Repetatur Infus. Gent. c.

CASE VII.

Nov. 1.—E. Perth, a black, aged forty-five years, has been for near ſix weeks paſt affected with an irregular intermittent, which moſt commonly follows the tertian type. The cold fit is ſevere, and very uncertain in the time of its attack and in its duration. In the hot fit ſhe complains of exceſſive pain of the head, eſpecially over her eyes, and of great pain of the back. The hot ſtage generally continues all night, ſeldom terminating by regular ſweats: it is followed by much laſſitude and uneaſineſs through the enſuing day. Her ſtrength is greatly impaired, her appetite bad; and ſhe is very coſtive.

Capiat ſtatim Sal. cathart. amar. ℥i. Cras incipiat ſumere Sol. min. guttas x. ter die.

6. After taking three doſes of the medicine, ſhe had a return of the paroxyſm on the 3d, but thought the cold fit later in its approach than uſual, and ſhorter. The hot fit continued

through a great part of the night, but the pain of the head was much leſs ſevere. She has had no return of the paroxyſm ſince, and feels only a little griping from the medicine.

℞ Repetatur Solutio.

10. Has had no return of the paroxyſm ſince the 3d. She complains only of debility and want of appetite.

Omittatur Solut. Capiat Infus. Gent. c. ℥ij ter die.

14. Begins to recover her ſtrength; her appetite is alſo better.

Repetatur Infus. Gent. c.

CASE VIII.

Octob. 3.—Ann Bowler, a black, aged fourteen years, has been, for ſome weeks paſt, affected with an irregular tertian, which is ſometimes, but not generally, preceded by a cold ſtage. The hot ſtage continues during the greater part of the day, and ſeldom terminates by ſweating. Her body is open; her appetite much impaired.

Capiat Solut. min. guttas viii: ter die.

10. The ſolution has now been taken for a week, during which time ſhe has had no return of

of the ague, nor has felt any nauſea or griping from the medicine. No complaint remains but debility.

CASE IX.

October 4.—Dinah Lawrence, a black, aged forty-four years, is every other day, about ſix o'clock P. M., ſeized with a ſevere cold fit, followed by great heat and violent pain of the head, eſpecially over the eyes, which ſymptoms continue through the whole night, and are not ſucceeded by any regular ſweating ſtage; ſhe is coſtive, and much debilitated; ſhe has had this complaint near three months.

Capiat ſtatim Sal. cath. am. ʒvi; et cras Solut. min. guttas x. ter die.

10. Has had no return of the fit ſince ſhe began to take the ſolution; ſhe finds no diſagreeable effect from it: is ſtill coſtive.

Repetantur Sal cathart. et Solut. min. ut antea.

14. Feels no complaint but what proceeds from debility; her appetite is better; ſhe was a little griped by the medicine.

Omittatur Solut. min. Capiat Infus. Gent. c. ℥ij ter die.

CASE X.

Sept. 24.—Jane Armſtrong, of a fair complexion, aged thirty years, is ſeized every day, at eleven o'clock A. M., with a head-ach ſo violent as to produce frequent ſhrieking and continual moaning. The pain chiefly affects the crown and one ſide of the head; it is in general preceded by a cold ſtage, though ſlight, and of ſhort duration. The hot fit, which is not very violent, continues till night, when it abates along with the pain; but is not entirely removed till morning: the paroxyſm is uſually terminated by a profuſe perſpiration. The patient is naturally of a delicate conſtitution, and has of late been much reduced by the remittent fever, from which ſhe recovered very ſlowly.

Capiat Opii gr. iij et Tart. emet. gr. ½ ingruente paroxyſmo.

25. The head-ach was almoſt entirely removed within half an hour after taking the pill; the paroxyſm terminated alſo more ſpeedily than uſual. Being very coſtive, ſhe was ordered to take half an ounce of purging ſalt the following morning.

26. The

26. The ſalt operated gently; ſhe had a very violent return of head-ach at the uſual time, which was relieved by the opium taken alone.

October 4.—She refuſes to take the bark: ſhe has every day had a return of head-ach at the uſual time, which was however removed by the opium.

Capiat Solut. min. guttas x. ter die; et repetatur Opium ſub initium paroxyſmi.

10. Has had no return of the paroxyſm ſince ſhe began the ſolution; feels no inconvenience from its uſe, but a ſlight diarrhœa, without any pain.

Repetatur Solutio.

14. Has had no return of the head-ach; ſhe ſweats much at night; is very weak, and has no appetite.

Omittatur Solut. Capiat Infus. Cort. Anguſt. ʒiij ter die.

This woman has never had a return of the paroxyſm, though a twelvemonth has now elapſed ſince the laſt report. She gradually recovered her ſtrength by the uſe of tonic remedies.

CASE XI.

Sept. 12.—Jeſſe George, a black, aged twenty

 years,

years, was yeſterday afternoon ſeized with a ſevere cold fit of an ague, which continued upwards of two hours, and was ſucceeded by great heat, ſevere pain of the head, nauſea, pains all over his body, more eſpecially in the back and loins, great reſtleſsneſs, and anxiety. Towards morning a general but not profuſe perſpiration took place; the ſeverity of the head-ach at the ſame time abated, and all the other ſymptoms wholly diſappeared: he has much thirſt; his ſkin is cool; his pulſe 72, and ſoft.

Capiat Solut. min. guttas x. ter die.

13. He had a return of the paroxyſm laſt night, at eight o'clock, four hours later than the former one. The cold fit, though very ſevere, did not continue long; the hot fit was ſtrong; the head-ach leſs violent. He had a very profuſe perſpiration this morning. His ſkin is now cool and moiſt, and his tongue clean; but ſome pain ſtill remains over the orbits of the eyes; he complains of thirſt, and is coſtive.

Capiat Sal. cathart. am. ʒi—Repetatur Solut. min.

14. The head-ach continued yeſterday till the afternoon, and then went off; the ſalts were not taken till this morning. He reſted well laſt night, and makes no complaint but of debility.

Repetatur Solutio.

15. He

15. He continued free from complaint yesterday, till towards evening, when he became hot and feverish; and after a very uneasy night, he, this morning, at eight o'clock, had a severe cold fit, attended with violent head-ach, which lasted near an hour. Two grains of opium, taken at this time, brought on a sweat, and terminated the paroxysm.

Repetatur Solutio.

16. He slept well last night, and feels no complaint but from debility. He has omitted the drops this day.

Repetatur cras Solutio.

17. Has had no return of the paroxysm; he feels no complaint but a slight griping from the solution.

℞. Tinct. Opii et Solut. min. āā ʒij m. capiat guttas xx. ter die.

20. He has had no return of the paroxysm since the 15th. At that time he probably brought it on by having exposed himself the night before to the damp evening air in his shirt. He feels no griping, or sickness, from the drops, which he still takes. He returned to his work this day.

CASE XII.

Auguſt 12, 1793.—Mr. T———, a European, of a dark complexion, with black hair, was ſuddenly ſeized, two days ago, with an acute pain of the head, chiefly over the orbits of the eyes, attended with naufea and vomiting. Theſe ſymptoms were ſoon followed by great heat and reſtleſsneſs, which continued through the whole night, and yielded in the morning to a profuſe perſpiration. On the 11th he was free from complaint; walked about, and ate heartily. In the evening, however, he was ſeized with a very ſevere ſhivering fit, which continued near two hours, and was ſucceeded by great heat and reſtleſsneſs, by ſevere pain above the eyes, and bilious vomiting. He was again relieved in the morning by a copious perſpiration. At ten o'clock, A.M. his ſkin was ſtill hotter than natural, and his pulſe rather quick; in other reſpects he appeared free from complaint.

Capiat Solut. min. guttas x. ter die.

13. The firſt doſe of the ſolution yeſterday produced vomiting; the ſecond gave him three ſtools;

ſtools; the laſt had no particular effect. He paſſed an eaſy night, without feeling any ſymptom of the fit, except a general uneaſineſs, which, however, ſoon went off. He complains this morning of ſlight pain over his forehead.

Repetatur Solutio.

14. The medicine again produced ſickneſs, and a ſlight diarrhœa, though he only took two doſes of it. He remained well till two o'clock, P. M.; he then became very hot, and had a ſevere return of the head-ach, attended with nauſea and vomiting. The heat, pain, and reſtleſsneſs continued till this morning, when a copious perſpiration took place, with which he is yet affected.

At ten o'clock A. M. his pulſe is 130; his ſkin pretty cool; his head-ach almoſt gone; his tongue ſomewhat furred. He complains of thirſt, and of ſlight pain of his bowels, with a ſenſation of numbneſs about the umbilicus

Omittatur Solut. Capiat pulv. Cort. Peruv. ʒi ſecunda quaque hora.

At ſix o'clock, P. M. he has a very ſlight head-ach, with a ſenſe of weight in the forehead; his eyes are more prominent and brighter than uſual. He has taken two doſes of bark ſince noon, the firſt of which produced vomiting; he has had

had one ſtool to-day; his urine is very high coloured; pulſe 130, ſoft, and leſs quick than in the morning.

Repetatur Cort. et capiat h. s. Tinct. Opii et Vin. Antim. āā guttas xxx.

15th. Ten o'clock, A.M—he has had a good night; ſome pain ſtill remains over his eyes, but it is leſs ſevere; his ſkin is rather hot, but moiſt; pulſe 112; his tongue dry and white; his urine high coloured, with a light cloud ſuſpended in it. He complains much of thirſt and fever, and of a pain in his back. He has taken, ſince yeſterday noon, ʒiſs of Peruvian bark.

Repetantur Cortex, Tinct. Opii, et Vin. Antim.

16. He paſſed an eaſy night, and enjoyed ſome refreſhing ſleep; he complains only of a ſlight pain over his eyes, and is able to ſit up. He had two ſtools in the night; his tongue is cleaner, but ſtill dry; pulſe 104 and ſoft, but eaſily quickened by the leaſt exertion. His urine is not ſo high coloured, and exhibits a flocculent cloud. He took ʒiſs of bark between ten o'clock, A. M. yeſterday, and ſix o'clock this morning.

Repetantur Cortex, Tinct. Opii, et Vin. Antim.

17. He was much griped yeſterday by drinking ſome cyder; has no complaint this morning

ing but from weakneſs. His pulſe is 104, and ſoft; his tongue clean and moiſt. His urine is much paler than before, and has a kind of gelatinous ſtriated cloud ſuſpended in it.

The ſame medicines were repeated.

18. He ſeems much better in every reſpect; his appetite is returning; his pulſe 90, and ſoft.

He continued the bark a few days longer, and had no return of complaint.

CASE XIII.

October 4.—Ann and Eliz. Davis, blacks, the former five, the latter ſix years old, have been for ſome time paſt affected with quotidian agues. The cold fit comes on at four o'clock, P. M.; is very ſevere, and frequently attended with vomiting. The hot fit uſually continues the whole night, being attended with great reſtleſſneſs, anxiety, and acute pain over the eyes; but is ſeldom ſucceeded by a regular ſweating ſtage. Their appetite and ſtrength are much impaired.

Capiant Solut. min. guttas vj. ter die.

9. Each of them had a return of the cold fit on

on the 4th, after the third dose of the solution. They have since had no return.

Repetatur Solutio.

11. There has not been any appearance of the paroxysm, nor any disagreeable effect from the medicine.

CASE XIV.

John Oliver, a black, aged five years, who was affected nearly in the same manner as the two last patients, began, on the 16th of August, to take four drops of the solution three times a day.

23. He had a return of the fit on the 16th, 17th, and 18th, but it commenced every day later, was less severe, and of shorter duration. Since the 18th he has had no fit, although the solution was discontinued. A slight tumefaction of the face has been observed for two days past, but is at present subsiding. He felt no nausea or pain from the medicine.

CASE

CASE XV.

Dec. 10.—Mary Jones, a black, aged thirty-ſix years, about three months ago was affected with a remittent fever, from which ſhe recovered very ſlowly, and has ſince continued in a ſtate of great debility. She has of late been ſubject to violent pains in the bowels, attended with diarrhœa. During the laſt month ſhe has had a regular tertian ague, the cold fit of which begins generally at ſun-ſet, but is not very ſevere, nor of long continuance. The hot fit is long and ſevere, being attended with violent head-ach, intenſe thirſt, and great reſtleſſneſs. Theſe ſymptoms are not terminated by a regular ſweating ſtage; and have often no remiſſion till the middle of the following day. She is feeble, and much emaciated.

Capiat Solut. min. guttas x. ter die; et Opii. gr. ij. ſub acceſſionem paroxyſmi.

12. The hot fit was much relieved by the opium; the paroxyſm was ſhorter, and the head-ach leſs ſevere. She is very coſtive.

Repetatur Solut. min. et capiat Sal. cathart. ℥ſs mane.

15. Con-

15. Continues the ſolution without feeling any ſenſible effect from it. She has had no cold fit or head-ach during the two laſt paroxyſms. The hot fit was much leſs violent and of ſhorter duration than formerly.

Repetatur Solutio.

18. Has had no return of the fit, nor any appearance of it ſince the laſt report; nor does ſhe perceive any nauſea or griping from the ſolution. Her appetite is ſtill much impaired.

Repetatur Solutio. Capiat Inf. Cort. Anguſt. ʒij ter die.

22. There has been no return of the paroxyſm. She finds her ſtrength and appetite much increaſed by the infuſion.

The uſe of the ſolution was diſcontinued.

CASE XVI.

Feb. 1.—John Jones, a European, of a ſallow complexion, aged twenty-eight years, is affected in the afternoon, every other day, with a violent cold fit, attended with rigors, and ſucceeded by a regular hot fit and ſweating. Until within a few days, he has been able to do his duty on ſhip-board as a ſeaman; but the paroxyſm returns now with ſo much violence,

as to confine him to his hammock. He has taken a large quantity of Peruvian bark at different times, which has never failed to prevent the next return of the paroxyſm; he has always, however, had a relapſe in a few days, through intemperance, and expoſure to the night air.

Capiat Solut. min. guttas x. ter die.

8. Has taken the ſolution without perceiving any ſenſible effect from it. The paroxyſm returns as uſual, but, as he ſays, with much leſs violence.

Repetatur Solutio.

15. The paroxyſm returns as uſual, but is ſhorter and leſs ſevere. Through miſtake, he has taken the ſolution only before the attack of each paroxyſm.

Repetatur Solutio; et capiat guttas x. ter die.

20. He has had no return of the paroxyſm ſince he took the ſolution as directed, and feels no nauſea or griping from it.

He continued the medicine a few days longer, and was reſtored to perfect health.

CASE

CASE XVII.

Feb. 1.—Ann Wicks, a mulatto, aged forty years, has been for a month paſt affected, every other day, with a violent cold fit, attended with rigors, and ſucceeded by great heat. She has alſo a ſevere pain over the forehead, and on one ſide of the head, extending to the neck and ſhoulder of the ſame ſide. There is much ſtiffneſs and pain in moving the neck during the intermiſſion. The cold ſtage commences about five o'clock, P. M. and continues near an hour. The hot fit does not terminate before morning, and is ſeldom ſucceeded by a regular ſweating ſtage. She is much debilitated by the long continuance of the complaint, and has lately given ſuck to a young child. Her appetite is alſo greatly impaired.

Capiat Solut. min. guttas viij ter die.

4. She has had no return of the cold fit. The hot fit continued only part of the night, and was unattended with head-ach or any other diſtreſſing ſymptom.

Repetatur Solutio.

12. She

12. She has had no return of the paroxyſm, and feels no ill effects from the ſolution. Her ſtrength is ſomewhat increaſed, but her appetite is ſtill bad.

Omittatur Solutio. Capiat Inf. Gent. c. ℥iſs bis die.

CASE XVIII.

Mrs. D. a delicate woman, of a fair complexion, aged twenty-four years, in the month of Auguſt laſt had a miſcarriage, from which ſhe recovered without much trouble, and enjoyed a tolerable ſtate of health till the beginning of October, when ſhe was ſeized with the common remittent fever of the place. From this complaint ſhe alſo recovered within a fortnight, by taking largely of the bark in powder and decoction. About the end of the month, however, ſhe ſuffered a relapſe, and made a very ſlow progreſs towards recovery; her ſtomach being only able to retain the bark in the form of a decoction. She laboured under great debility, very profuſe night ſweats, and frequent hectic flushings during the day, with loſs of appetite, and general tremors on uſing the leaſt exerciſe. Theſe ſymptoms were at length

conſiderably alleviated by the infuſion of Anguſtura bark, elixir of vitriol, and other tonics.

Dec. 15. Yeſterday, at ſix o'clock, P. M. ſhe had a cold fit, with rigors, which laſted near half an hour, and was ſucceeded by a hot fit, attended with great pain of the head, nauſea, vomiting, and reſtleſſneſs, which continued through the whole night; towards morning ſhe was relieved by a partial ſweat, but remained very weak and languid.

16. Yeſterday, at the ſame hour, ſhe had a return of the paroxyſm, the ſymptoms of which were mitigated by an opiate taken ſoon after its commencement: ſhe had a copious perſpiration during the night, and ſeems free from complaint this morning.

18. Had a return of the fit on the 16th and 17th, but was relieved as before by an opiate. She refuſes to take bark.

Capiat Solut. min. guttas viij. ter die.

20. She has had no return of the cold fit ſince the 18th. The hot fit was much ſhorter and leſs ſevere. She experiences no inconvenience from the medicine.

Repetatur Solutio.

22. She has had no return of the paroxyſm, but feels a ſlight pain in her bowels.

Capiat ſtatim Tinct. Opii guttas xx. et ſp. lav. c. ʒſs.
Repetatur Solut. min.

24. The

24. The pain of her bowels was removed by the opiate; ſhe has had no return of the paroxyſm; reſts pretty well during the night, but ſweats much towards morning.

Omittatur Solutio; et capiat Infuſ. Gent. c. ℥i ter die.

30. Her ſtrength is returning. Her appetite is good, and ſhe has had no return of the paroxyſm.

This lady continued to enjoy a good ſtate of health, till the 20th of March, 1793, when ſhe was affected with a diarrhœa, attended with acute pain in her bowels, chiefly about the umbilicus. She was ſoon relieved from theſe complaints by an opiate, and a few powders, conſiſting of the colombo root joined to an aromatic: but on the 25th, ſhe had a return of an intermittent fever, the cold fit of which was very ſevere. It began at ſix o'clock in the evening, continued near two hours, and was followed by a hot fit, which laſted all night, terminating towards the morning in a ſlight perſpiration, and leaving her low and weak the remainder of the day.

28. She refuſed yeſterday to take an opiate on the approach of the cold fit, having on former occaſions found her head diſagreeably affected by it. The paroxyſm proved very ſevere: the

hot fit continued all night, and was ſucceeded by partial ſweats about the head and neck. She is very weak this morning, and complains of a great pain of the head and back; of lowneſs of ſpirits and general uneaſineſs.

Capiat Solut. min. guttas viij. ter die, ex Infuſ. Cort. Anguſtur. cyatho.

30. The ſolution did not diſagree with her in any reſpect; ſhe had a cold fit laſt night, but it was much leſs ſevere than uſual: ſhe is alſo in better ſpirits to-day.

Repetatur Solutio.

April 1. There was no cold fit yeſterday; but ſhe had a hot fit, which continued all night, and terminated in a very profuſe perſpiration. Her ſpirits are much revived; ſhe is conſiderably ſtronger, and has a better appetite.

Repetatur Solutio.

6. She continues the ſolution without feeling any inconvenience from it; and has had no return of the fit, or night-ſweats, ſince the 1ſt: her appetite at preſent is good.

Repetatur Solutio.

8. She has had no fit, and recovers her ſtrength gradually. No nauſea or griping has ever been produced by the ſolution.

Omittatur Solutio. Capiat pulv. rad. colomb. gr. xv. ter die.

CASE

CASE XIX.

Feb. 1, 1793—Mrs. H. of a fair complexion, aged twenty-four years, during the months of September and October laſt, had two ſeveral attacks of the remittent fever, from which ſhe recovered ſpeedily by means of the bark: ſince that time ſhe has continued in a very weak irritable ſtate, ſubject to pains of the bowels, and to frequent though ſlight returns of a febrile complaint, which continued only for a day or two, and commonly yielded to an opiate. On the 27th of January ſhe had a cold fit at eight o'clock in the morning; this was ſucceeded, in about an hour, by a burning heat of the ſkin, with fluſhing of the face, great reſtleſſneſs, and ſevere pain of the forehead. Her eyes, at the ſame time, appeared bright and prominent; ſhe complained alſo of a ſenſe of heat in them, and was unable to bear the light. In the evening, a copious perſpiration enſued, and conſiderably alleviated the ſymptoms; ſhe had, however, a ſlight head-ach through the whole night: the

fit has returned every morning at the ſame time for the laſt four days.

Feb. 2. The paroxyſm appeared this morning as uſual, with a ſevere cold fit and head-ach, but was rendered much ſhorter and leſs diſtreſſing by an opiate draught taken ſoon after its acceſſion.

Capiat Solut. min. guttas viij. ter die.

5. She had a ſlight return of the cold fit this morning, with a little head-ach, but the paroxyſm was of ſhort duration.

Repetatur Solutio.

6. She has had no cold fit to-day, nor any pain of the head; the hot fit returned at the uſual time. Her face is much fluſhed, and her ſkin hot, but with leſs anxiety and reſtleſſneſs than heretofore: ſhe finds no inconvenience from the ſolution. The opiate was not taken to-day.

Repetatur Solutio.

10. She has had no return of the paroxyſm, nor has felt the ſlighteſt ſymptom of its approach ſince the 6th; ſhe complains only of a ſlight pain or uneaſineſs in her ſtomach. Her appetite ſtill continues weak.

Omittatur Solut. min. Capiat tinct. opii guttas xx. ſtatim.

14. She begins to recover her ſtrength and appetite;

appetite; the pain of the ſtomach was immediately removed by the opiate.

All the patients whoſe caſes are here related, have continued to enjoy good health ſince cured by the ſolution; and though ſeveral months have now elapſed, none of them have experienced the leaſt unpleaſant ſymptom which could be attributed to that remedy. The women continued to labour under a ſuppreſſion of the catamenia, until their ſtrength was entirely reſtored.

Mrs. H. (Caſe XIX.) though enjoying a good ſtate of health, had no appearance of them till the middle of Auguſt laſt, when they flowed for ſeveral days rather profuſely.

In Caſe IV. I had little proſpect of ſucceſs from the uſe of the ſolution, the child having become very weak and irritable by frequent relapſes: but as he had for a length of time taken the bark in large doſes without any effect, I was induced to try the mineral ſolution, with a view of checking the returns of the paroxyſm, hoping afterwards to complete the cure by the bark; which might prove more effectual after its uſe had been ſuſpended a few days.

In Cafes I. X. XIII. and XIV. there was an evident enlargement of the fpleen, forming a projection below the cartilages of the ribs. In Cafe X. it was fo large as to extend nearly as low as the crifta of the os ilium. After the ague had ceafed, the patient continued to ufe corroborant medicines, taking at the fame time fmall dofes of calomel, but without any fenfible effect on the tumor; it yet remains nearly in the fame ftate, not, however, caufing much uneafinefs. In Cafes XIII. and XIV. as the patients fpeedily regained their health after the ague had ceafed, and felt no uneafinefs from the enlargement of the fpleen, I did not think it proper to ufe any medicine, excepting a purgative dofe of calomel occafionally, becaufe, in many fimilar cafes, where this medicine had been ufed, even in very fmall dofes, a falivation was very foon excited, the tumor not being at all affected by it, whereas the patient was rendered extremely weak and irritable. The only inftance of tumefaction which could with any probability be referred to the ufe of the folution, was Cafe XIV. in which, however, it proved fo flight, as fcarcely to deferve notice.

In order to give the mineral folution a fairer trial, I avoided, in many inftances, making

ufe

uſe of two very powerful means uſually employed for the purpoſe of diminiſhing the violence of the paroxyſm, and which frequently indeed put a total ſtop to it; I mean, opium and emetics: when two grains of opium are given a ſhort time before the paroxyſm is expected, it ſeldom fails to bring the fit to a ſpeedy termination by a profuſe ſweat; and generally relieves the violent pain of the head, which is ſo diſtreſſing during the hot fit, as in Caſes X. and XV. The recurrence of the paroxyſm being once obviated, I have found that a full doſe of opium at night affords more comfortable reſt, and more certainly prevents the ſolution from affecting the bowels, than when the tincture of it is added to the mineral ſolution; a mixture of this kind always becomes turbid, and the opium is partly ſeparated.

Intermittents partake much of the nature of remittents, and the two diſeaſes have a very uncertain boundary; whenever, therefore, the intermiſſions are imperfect and indiſtinct, the exhibition of an emetic is attended with moſt beneficial effects. In many inſtances this practice puts a temporary ſtop to the returns of the fit, and in every caſe conſiderably diminiſhes its violence. The proper time of giving an

emetic

emetic, is about two hours before the paroxyſm is expected; and the beſt mode is to employ a ſolution of tartarized antimony in divided doſes, at intervals of eight or ten minutes, until full vomiting be produced. When the patient has vomited a few times, and his ſtomach is a little ſettled, a more moderate doſe of the antimonial ſolution, joined to a full doſe of opium, ſeldom fails to produce a copious perſpiration before the attack of the cold fit. This method generally ſucceeds in preventing the immediate recurrence of the paroxyſm: but in thoſe caſes where the intermittent has continued long, and ſeems to return by the power of habit, it will be proper to repeat the emetic once or twice more before the time when the paroxyſms are expected.

I think it proper here to obſerve, that antimonials, in the nauſeating doſes in which they are frequently given during the remiſſion or apyrexia, with a view of procuring a more perfect ſolution of the diſeaſe, are ſeldom found adequate to the purpoſe; on the contrary, the continued action of ſo powerful a ſtimulus, in general, produces a correſpondent ſtate of debility, and relaxes the muſcular fibres of the ſto-

mach ſo much, that neither food nor medicine can be properly retained.

The remittent fever is, in many caſes, very mild; whence the remiſſion has often been miſtaken for an intermiſſion. This miſtake is more liable to be made when the remittent fever is preceded by an evident and ſevere cold ſtage at each return of the paroxyſm, and is followed by a regular hot, and ſweating ſtage. The remittent may, however, be diſtinguiſhed from the intermittent fever; 1ſt, by a ſlight pain which remains fixed in the forehead, or over the orbits of the eyes, during the apyrexia; 2dly, by the pulſe, which, though not more frequent than in health, yet retains a degree of quickneſs or ſharpneſs through the whole of the remiſſion; 3dly, by the ſtate of the ſkin, which, though moiſt, feels hotter than natural. In ſuch caſes I have not found the mineral ſolution ſo ſucceſsful as in thoſe where the intermiſſion was complete; for which reaſon it ſeems moſt prudent to place our ſole dependance upon the bark, as in Caſes IV. and XII. Sometimes, however, when the patient could not be prevailed upon to take the bark in proper doſes, I have found much advantage from joining it with the mineral ſolution, by which means a ſmaller quantity

tity of bark will anſwer the intended purpoſe. But whenever immediate danger preſents itſelf, or is to be apprehended from a continuance of the fever, the bark, given in large doſes, is the only medicine to be depended on.

The mineral ſolution uſually fails in ſome irregular caſes, which at firſt view reſemble intermittents, and have been improperly ranked with them, under the denomination of erratic or anomalous intermittents. A morbid increaſe of irritability appears to be the foundation of theſe irregular complaints; they affect principally thoſe who have been debilitated by frequent attacks of fever, or by lingering diſeaſes; alſo children; and women, more eſpecially thoſe who give ſuck; and, in general, perſons of a weak delicate habit. The ſymptoms which occur in theſe complaints are nearly as follow: during the afternoon, or towards evening, the patient becomes uneaſy and reſtleſs; his ſkin feels dry, and is hotter than uſual, but without imparting the burning heat uſually obſerved in the hot ſtage of intermittents; the pulſe becomes quick, and rather more frequent than natural; a pain is ſometimes felt in the head, either on the crown, or on the back part of it; the thirſt is ſeldom very great; diſagreeable clammi-

clammineſs, however, takes place in the mouth. Theſe ſymptoms are ſometimes preceded by ſlight chills running down the back, which, however, when they do occur, are not of long continuance, and never accompanied with violent ſhiverings.

In this manner the patient is harraſſed during the whole night*, but obtains relief towards morning, when a partial ſweat ſometimes appears about the head and breaſt. Excepting a degree of languor and debility, little or no complaint is felt till the return of evening. The duration of theſe complaints is very uncertain; they ſometimes affect the patient daily for one or more weeks; at other times abate or diſappear for a few days, and then return as before. Whatever increaſes the irritability of the body, may be conſidered as an occaſional cauſe of them; but the moſt common as well as moſt powerful one is too much fatigue, along with expoſure to a hot ſun.

In theſe caſes, after evacuating the ſtomach and bowels by a gentle emetic or purgative, it is commonly ſufficient to exhibit ſome tonic, in a form agreeable to the patient's ſtomach. The

* Hence the denomination of night-fever.

Peruvian

Peruvian bark does not appear to produce any better effects than the other vegetable tonics, as Gentian, Colombo, &c. An infuſion of Anguſtura bark is what I moſt frequently employ, and find moſt uſeful, taking care to prevent the coſtiveneſs ariſing from its uſe, by giving, at proper intervals, a doſe of calomel.

For children, who cannot eaſily be induced to take bitters, after the previous uſe of an emetic, a few moderate doſes of calomel are commonly ſufficient.

Notwithſtanding the effects of arſenic appear to be equally as powerful and nearly as certain as thoſe of bark in the cure of intermittent fevers, yet it muſt be confeſſed that perfect ſtrength is leſs ſpeedily recovered when the cure has been accompliſhed by arſenic alone, than when bark has been employed. This objection to the uſe of arſenic is of leſs conſequence in cold climates, where, if the ague has not been of long ſtanding, the debility induced by it is ſeldom very conſiderable. In tropical countries, however, a few attacks of an intermittent frequently reduce the patient ſo much, that even when the paroxyſm has ceaſed to return, the extreme debility which remains, is

of

of itſelf ſufficiently alarming to demand every attention from the practitioner.

It does not appear improbable that the bark owes its ſpecific power, in the cure of remittent and intermittent fevers, to ſome peculiar principle in its compoſition, which has hitherto eluded the reſearches of experimenters, and which they have in vain attempted to imitate by various combinations of bitters and aſtringents. In whatever this peculiar power of the bark may conſiſt, the ſame quality appears to be poſſeſſed by the arſenic in a conſiderable degree. Both remedies probably effect the cure of intermittents, by their action upon the fibres of the ſtomach, ſince they often operate ſpeedily, and even in a ſmall doſe; but the power of the arſenic ſeems to ceaſe here; whereas the bark is capable of reſtoring tone to the ſyſtem in general. The ſame effect may perhaps be nearly obtained by joining ſome tonic medicine to the arſenic. With this view, in many caſes, after the ſolution had been taken a week or ten days, I diſcontinued its uſe, and ordered the patients to take the Infuſ. Anguſt. Infuſ. Gent. c. &c. until their ſtrength was completely reſtored. It may be found ſtill more advantageous to employ

ploy theſe remedies along with the mineral ſolution.

Arſenic ſeems to have been oftener employed as a medicine in Germany, than in any other part of Europe; but chiefly by the empirical claſs of practitioners, which no doubt prevented its introduction into general uſe. Many eminent phyſicians in Germany, as well as elſewhere, have, however, ſpoken highly in its favour, and occaſionally preſcribed it. Like many other active remedies, it has been much abuſed by the bold and the ignorant, and has been given in doſes which no man of prudence would venture to direct; eſpecially as we know that the ſame good effects may be obtained by moderate doſes of it, and without the leaſt riſk. The following obſervations, extracted from a German work *, will ſhow how extenſively this medicine has been uſed on the Continent, and how little caution has been obſerved in its exhibition.

Dr. Slevogt, Profeſſor of Anatomy at Jena, in 1700, recommended the uſe of arſenic, extolling it as the beſt, moſt certain, and ſafeſt cure of intermittents, eſpecially of tertians and quartans. He employed it in doſes of a grain

* Nicolai Recepten und Kurarten. 8vo. Jena, 1780.

or

or a grain and a half mixed with a proper quantity of Theriaca; not only giving it on the days of the apyrexia, but alſo a ſhort time before the acceſſion of each paroxyſm. He aſſerts, that in fifty inſtances, two or three doſes were ſufficient to put a total ſtop to the diſeaſe, and that he never obſerved the leaſt ill effect from it.

Melchior Friccius* recommends arſenic in intermittents, and declares he has uſed many drachms of it in the cure of ſuch fevers; but confeſſes that he had often met with relapſes afterwards.

Lanzonus † quotes a letter from Valiſnieri to one of his friends, written in 1707, in which he ſays the French ſurgeons were accuſtomed to cure long-continued intermittents with a ſmall quantity of arſenic: and he adds, that their remedy ſeemed to reſemble much the famous aqua del peteſino, which was a ſtrong ſolution of arſenic boiled in a copper veſſel ‡.

* De Virtute Venenorum medica. 8vo. Ulmæ, 1701.—See alſo London Medical Journal, Vol. VII. p. 194.

† Lanzoni Oper. omn. med. phyſ. 4to. Lauſ. 1738. Tom. I. p. 68.

‡ The *Aqua della Toffanina* (ſo called from the inventor), *Aquetta di Napoli*, *Poudre de Succeſſion*, *Eau Mirable*, &c. were preparations of arſenic frequently uſed as poiſons during the laſt century.

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Keil * praiſes arſenic as a certain and ſafe ſpecific in intermittents, when prepared and adminiſtered in the following manner: half an ounce of white arſenic, finely powdered, is to be put into a glaſs, or tea-cup; half an ounce of diſtilled vinegar is then to be added, and evaporated over the fire, being conſtantly ſtirred at the ſame time with a wooden ſpatula; the ſame quantity of vinegar is again to be added and evaporated in like manner. After this proceſs has been repeated ſix times, the reſiduum is finally to be waſhed with warm water, and dried; a drachm of the dry powder is to be made up into ſixty pills by means of a ſcruple of wafers ſoftened with water. Previouſly to the uſe of the pills, the patient is to take an emetic compoſed of tart. emet. or ſulph. aurat. antim. and a little vitriolated tartar, or ſome purgative medicine on the morning free from fever: the next day, or only a few hours before the acceſſion of the paroxyſm, one of the pills is to be taken faſting, and nothing is to be eaten or drank after it for three or four hours. When this has been repeated three days, during the apyrexia, or a few hours before the

* Anatom. Chirurg. Medicin. Handbuchlein. 8vo. Konigſberg, 1761.

attack of the paroxyſm, the fever commonly ceaſes. He affirms that this practice has been attended with ſucceſs in ſeveral hundred caſes, when every other remedy had been employed in vain; that he has never obſerved the leaſt ill effect to accrue from it; but, on the contrary, that thoſe who had before looked thin and ill, had become, in conſequence of it, fat and ſtrong; and that he knew many perſons who had uſed this remedy fifteen or twenty years before, and who continued to enjoy a ſtate of perfect health.

Dr. Jacobi * recommends the uſe of arſenic ſtrongly in fevers: he directs one part of arſenic and twelve of ſalt of tartar, to be mixed with 180 parts of water, and boiled till one half has evaporated; when cold, as much freſh water is to be added to it as has been loſt by the evaporation, together with a little ſpirit of wine. The doſe for adults is twenty-five drops, to be given on the day which is free from fever, at ſeven A. M., at three, ſix, and nine, P. M. Before the uſe of this medicine, the primæ viæ muſt be evacuated by emetics and purgatives; and the common febri-

* De prudenti uſu Arſenici, ſale Alcalico domiti, interno ſalutari, Diſſert.—Vide Act. Acad. Elect. Mogunt. Tom. I. p. 216. 8vo. Erford. 1751.

fuge remedies ſhould be uſed for ſome time. Dr. Jacobi obſerves that he has employed the above preparation not only in intermittents, but alſo in continued fevers, with the greateſt ſucceſs, and without ever experiencing any bad effects from it.

Heuermann * ſays that arſenic is uſed in Holſtein, at Copenhagen, and ſome other places, as the moſt certain remedy for the cure of intermittents; that he has himſelf given it with conſtant ſucceſs, in fevers, to patients who were not able to retain other medicines on the ſtomach in a proper quantity; and that two caſes, wherein frequent relapſes had occurred, were entirely cured by this remedy. He prepares a ſolution of arſenic in the following manner: half an ounce of white arſenic, and ſix ounces of alkaline ſalt, are added to lbiſs of water, and then evaporated to dryneſs. The ſame quantity of water is added a ſecond time to the reſiduum, and evaporated to one half, which is coloured red by a few poppies. Of this he directs from ſeven to ten drops to be taken during the day, beginning immediately after the paroxyſm is over, and omitting it a ſhort time before the return of the next. If the

* Vermiſchte Bemerkungen und Unterſuchungen. Vol. I. 8vo. Copenhagen, 1765.

ſolution

ſolution produces vomiting, it is too ſtrong, and muſt be diluted; only one doſe is to be given in twenty-four hours, and the patient muſt be kept moderately warm, to promote a gentle perſpiration. Expoſure to cold, he ſays, is as hurtful during the uſe of this as of other febrifuge remedies, as it diſturbs Nature in her operations, and retains in the body the noxious matters which ſhe is endeavouring to expel. If in the firſt three or four days after the uſe of theſe drops, the fever does not ceaſe, he recommends that the ſame doſe ſhould be repeated twice a day, which commonly proves ſufficient. The ill conſequences which have been obſerved after the uſe of arſenic, as palſy, trembling of the limbs, blindneſs, deafneſs, &c. he aſcribes to the improper preparation and imprudent uſe of it; aſſerting, that it is a ſafe remedy when properly prepared.

In the Ephemerid. Acad. Nat. Curioſ.* arſenic is alſo celebrated as an infallible ſpecific for intermittents. Three or four grains of powdered white arſenic are directed to be put into a ſmall uncovered glaſs with a proper quantity of water, and placed upon the fire till a ſolution takes place, when it is to be well ſtirred up and given to the patient: the fever, we are in-

* Dec. II. Ann. III. p. 132.

formed, is by this means certainly prevented from returning. The patient ſhould eat nothing for twelve hours before; but a quarter of an hour after having taken the medicine, he is allowed a gill of warm water, in which a quantity of butter is diſſolved, together with the yolk of an egg; after which, nothing more is to be given for ſome hours. There generally follows a conſiderable degree of uneaſineſs, and a profuſe ſweat; and by theſe means, it is ſaid, every intermittent, even a quartan, may be readily cured. Two other formulæ are given in the ſame work*, and recommended as highly uſeful in the cure of intermittents, viz.

℞. Tart. crud. ʒi. Arſen. cryſt. ʒſs. Pip. long. ℥ſs. Lap. prunell. ʒiſs. Specif. febrifug. Crollii ʒiij. M.

The doſe is from gr. v. to ℈ſs.

The other is

℞. Arſen. alb. gr. v. Lap. prunell. vel Nitri depur. gr. xv. M. pro una doſi.

Profeſſor Ackermann † relates, that in Pauſa, a town of Saxony, a ſurgeon's family had been poſſeſſed for more than a century of a ſecret remedy againſt melancholy, which conſiſted of two grains of arſenic mixed with a drachm or more of white ſugar, to be taken

* Dec. II. Ann. V. p. 474.

† Neues Magazin für Aerzte. Vol. II. p. 401. 8vo. Leipſic, 1780.

early

early in the morning, along with a large quantity of mucilaginous drink. The medicine produced a violent vomiting, so as to agitate the whole body, which continued not less than six hours; after this, he observes, the patient usually enjoyed a quiet sleep, and became more rational. The remedy was persisted in, care being taken that the effects of the first dose should be completely over before a second one was administered. Many repetitions of the medicine were not however requisite, as the disease, in general, soon yields to this mode of treatment; the patient was afterwards directed to continue a mucilaginous diet for a few weeks. Professor Ackermann examined some of the patients who had been cured by the surgeon at Pausa, and found that no ill effects had arisen in consequence of it. The same person, it is added, employed arsenic very frequently for the cure of intermittents; he dissolved two grains of arsenic in a pint of water, and gave two, or three table spoonfuls for a dose every day; under this treatment the fever seldom recurred more than twice; but he remarked that the patients were longer in recovering their strength than when the bark had been used.

Professor Ackermann farther observes, that another surgeon in the same place likewise

employed arſenic with great ſucceſs; he gave fifteen drops of a ſolution of arſenic in water, along with alkaline ſalt, but the Profeſſor had not been able to aſcertain the exact proportions. A doſe was ordered to be taken as ſoon as the patient felt the approach of the fit, and a quantity of warm tea was to be drank immediately afterwards. This produced a vomiting, which was encouraged as much as poſſible by repeated draughts of the tea. In this manner, it ſeems, he had cured many obſtinate agues by two or three doſes of the ſolution; and, amongſt others, a quartan which had continued upwards of two years.

From ſome of the foregoing narratives, arſenic ſeems to have been uſed with as little precaution as emetic tartar; and ſince it appears, on good authority, not to have been productive of bad conſequences, even in very large doſes, we may be induced to lay aſide that extreme anxiety with which we generally preſcribe it; and may be encouraged to perſiſt in the uſe of a remedy which, when prudently adminiſtered, is both ſafe and efficacious.

Many of our moſt active and approved medicines, as preparations of mercury and antimony, the ſquill, foxglove, &c., are capable of

of producing as violent effects in the conſtitution, when given in too large a doſe, as arſenic itſelf. All theſe medicines met with the ſame, if not ſtronger, oppoſition when firſt introduced, as arſenic does from many at preſent. It is well known that antimonial preparations were declared to be poiſonous, and that the uſe of them was prohibited by a decree of the faculty of Phyſic at Paris in the year 1566; which decree was not repealed till 1637. We ſhall ceaſe, however, to wonder at the prejudices formerly entertained againſt theſe medicines, when we conſider, that even at the preſent day ſimilar objections are made upon the Continent, eſpecially in Germany, to the uſe of the bark, a remedy, the reputation of which has been ſo fully eſtabliſhed by the united teſtimony of ſo many eminent practitioners, ſupported by almoſt innumerable experiments.

Mr. Theden, one of the moſt celebrated ſurgeons in Germany, and Surgeon General to the Pruſſian army, in ſpeaking of the treatment of intermittents, obſerves*, that when his patients had previouſly enjoyed a healthy ſtate of body, he was generally able to effect a cure in ſix or

* Unterricht für die Unterwundärzte. 8vo. Berlin, 1793.

eight

eight weeks. As he entertained the common idea that bark is apt to produce obſtructions and enlargement of the viſcera, œdematous ſwellings of the extremities, &c. he cautiouſly avoided giving this remedy until he had tried every other means. During the firſt three weeks he employed different medicines, with a view to looſen the morbific matter, and to render it fit for expulſion from the body; he then gave two ounces of bark, in doſes of half a drachm, every two hours. After an interval of eight days, during which only bitters were preſcribed, he ventured again to exhibit an ounce of the bark, and thus completed a cure. He cautions us againſt the uſe of bark whilſt the face retains a yellow tinge, or whilſt the febrile matter remains in the conſtitution; he confeſſes, at the ſame time, that he has ſeen œdematous ſwellings of the lower extremities after agues where no bark had been employed.

Dr. Vogel* is likewiſe of opinion that many cachectic diſeaſes, particularly obſtructions of the viſcera, dropſy, jaundice, phthiſis, tympanitis, coughs, aſthma, hemicranium, deafneſs, cataract, vertigo, &c. are frequently the con-

* Handbuch der praktiſchen Arzneywiſſenſchaft. 8vo. Stendal, 1781.

ſequences

ſequences of an improper treatment of intermittents; more eſpecially when the cure has been attempted by aſtringents, arſenic, &c. or even by an unſeaſonable exhibition of the Peruvian bark, whilſt the morbific matter ſtill remains in the ſyſtem.

The objections to the uſe of theſe medicines are ſo vague, that they appear to originate from popular prejudice and ill-grounded theories, rather than from any juſt practical deductions; they will therefore have little weight with thoſe who are not contented with bare aſſertions, but make actual obſervation and experience the ſtandards of truth.

Having frequently found the moſt beneficial effects from the mineral ſolution, and having never obſerved any ill conſequences to ariſe from its uſe, I may preſume to recommend a trial of it to ſurgeons practiſing in warm climates, and particularly upon the coaſt of Africa.

The high price of bark may ſometimes prevent ſurgeons of ſhips from laying in, at their own expence, ſuch a ſtock of this valuable medicine as will enable them to employ it freely in every caſe which requires its uſe. For notwithſtanding the frequent complaints of ſeveral reſpectable ſurgeons in the navy, the quantity of

of bark allowed by government to ſhips on foreign ſtations, is much too ſmall; and moſt of the merchant ſhips trading to this coaſt are ſtill more inſufficiently provided.

Of the two moſt frequent diſeaſes upon the coaſt of Africa, the remittent and intermittent fever, it is certain that the latter, though leſs rapid in its courſe, and apparently leſs dangerous than the former, yet for the moſt part occaſions that irremediable injury to the conſtitution, which ſo often befalls Europeans trading upon this coaſt. There are few, even of thoſe who are ſaid to be ſeaſoned to the climate by long reſidence, who have not ſuffered ſeverely from repeated attacks of intermittents. This in a great meaſure ariſes from the unhealthy ſituation in which they live for the convenience of trade. They generally fix their reſidence on the banks of ſome river, or narrow creek, whoſe oozy ſhores, ſurrounded by mangroves, and excluded from the wholeſome breezes, are a conſtant ſource of miaſmata and contagion; to this muſt be added the debauched and irregular courſe of life which moſt of them lead. Though ſeaſoned to the climate, as they ſuppoſe, their unhealthy ſallow complexions and emaciated bodies, the frequent hectic fluſhings of the face,

face, ſwelled legs, &c. attended with obſtructions and enlargement of the abdominal viſcera, ſufficiently indicate to every obſerver the ſhattered ſtate of their conſtitutions. The ague probably ſtill continues to return once a month or oftener, and harraſſes them a few days, without being much noticed; for the ſeverity of the diſeaſe ſeems to be conſiderably abated by its frequent recurrence, though its bad effects in the end are equally certain. As their appetite during the intermiſſion is frequently keen, and even voracious, they flatter themſelves that the conſtitution is not impaired by frequent returns of the diſeaſe; many alſo are negligent, from a confidence in the popular prejudice, that a cold fit ſhows the abſence of danger.

In theſe caſes, therefore, when the bark cannot be procured, or, as more frequently happens, when the patient has conceived a diſguſt for it, and cannot be prevailed upon to take it in a ſufficient quantity, the mineral ſolution promiſes to be a ſafe and effectual ſubſtitute for it.

During the laſt rainy ſeaſon I have had frequent

quent opportunities of exhibiting the mineral ſolution in intermittents with the ſame good effects as in the preceding year. Out of the number of caſes which occurred in the preſent ſeaſon, I have ſelected the two following, as being the only inſtances of quartans I have met with ſince I began to uſe the mineral ſolution.

CASE XX.

Sept. 11, 1793.—John Thompſon, a mulatto, aged thirty years, was ſeized, about two months ago, with an ague, which returned every ſecond day. After the ſecond paroxyſm he took an emetic, and ſoon after the operation of this, an opiate, which appeared to put a ſtop to the diſeaſe. A month ago he was again ſeized with cold ſhiverings, followed by an increaſe of heat, which terminated by a profuſe ſweat. The fit now returns every fourth day; the cold ſtage of which, commencing about noon, is very ſevere: the hot ſtage continues through the whole night, with violent head-ach, and towards morning is relieved by a profuſe ſweating.

ing. His appetite is pretty good; his body open.

Capiat Vesp. Antim. Tartar. gr. ij. cu. P. Ipecac. ℈j. Cras incipiat sumere Sol. min. guttas xij. ter die.

20. The emetic operated well. He took the solution regularly for four days, and then omitted it, finding no return of his complaint.

30. He has had no return of the paroxysm, nor has taken any medicine since he left off the solution.

CASE XXI.

Sept. 8.—Anne Crankepoor, a black, aged twenty-eight years, has every fourth day, at noon, a severe cold fit of the ague, which continues near two hours, and is attended with violent rigors and pains of her bones; these symptoms are followed by a hot stage of long continuance, but which terminates by profuse sweating. She is affected, during the whole paroxysm, with violent pain of the head, stomach, and back, which also continue through the intermission, though with some abatement. She has taken an emetic and two anodyne draughts without any relief; and

has

has had no ſtool for eight days. Her head-ach is at preſent very ſevere; her pulſe quick and frequent; her ſkin hot and dry.

Capiat ſtatim Camphor. gr. x. Tinct. Opii, guttas xxv, Aq. font. ℥ſs. et cras mane Sal. cathart. amar. ℥iſs. part. vicib.

9. She ſweated profuſely with the draught, and is much eaſier this morning. Her head-ach is conſiderably relieved; her pulſe ſoft and regular. Both doſes of the Sal. cath. amarus produced vomiting.

Capiat ſtatim Ol. Ricini ℥i.—Repetatur Hauſtus h. s.

10. She could not yeſterday retain the oil on her ſtomach, nor has yet had a ſtool. She paſſed an eaſy night, and feels no complaint this morning, excepting great languor and laſſitude, with a ſenſe of weight and fulneſs in the abdomen.

Capiat ſtatim Calom. gr. v. Extr. Cathart. ℈j.

11. The pills operated gently three times; her bowels are much eaſier; ſhe feels a ſlight pain of the head and general uneaſineſs, as if the fit was approaching.

Incipiat cras ſumere Solut. min. guttas x. ter die.

13. The fit returned on the 11th at the uſual time with great violence. The pain of her head and ſtomach was alſo very ſevere; ſhe yet feels

feels ſome pain of her ſtomach, with great reſtleſſneſs and uneaſineſs. The ſolution has not been taken till this day.

17. The paroxyſm returned at the uſual time on the 14th, when ſhe was affected with very ſevere head-ach and pains of the ſtomach and back, which ſtill continue, being accompanied with great languor. She has taken only five doſes of the ſolution ſince the 13th, and thoſe not at regular times. She was very coſtive on the 15th, when ſhe took

Calom. gr. v. c. Extr. Cathart. gr. xv.

which operated twice. She expects the paroxyſm to-day.

Repetatur Solutio.

18. The paroxyſm did not return yeſterday, until ſix P. M.; the cold ſtage was very ſevere, and attended with great pain of the ſtomach and head; but theſe ſymptoms were much relieved by two grains of opium. She ſweated profuſely during the night, and feels a ſlight head-ach and pain of the ſtomach this morning, with languor and debility. Her body is open; her pulſe natural.

Repetatur Solutio. Sumantur Opii gr. ij. urg. dolore Ventriculi.

20. She continues ſtill weak and languid;

the pain of her ſtomach was wholly removed by the opiate.

Repetatur Solutio.

23. She has had no return of the paroxyſm ſince the 17th, and makes no complaint but of debility; ſhe is, however, able to walk about, and her appetite is ſomewhat better.

Omittatur Solut. min. Capiat Infus. Corticis Anguſt. ℥iij ter die.

Early in October ſhe had entirely recovered her health and ſtrength.

II. *An Account of the good Effects of a Solution of Sal Ammoniac, in Vinegar, employed, as a topical Application, in Caſes of lacerated Wounds. By Mr.* Henry Yates Carter, *Surgeon at Kettley, near Wellington, in Shropſhire.*

IN the ſecond volume of Medical Facts and Obſervations*, I took occaſion to mention, in a curſory manner, the good effects I had experienced, in lacerated wounds, from a ſolution of ſal ammoniac in vegetable acid, em-

* P. 14.

ployed

ployed as a topical application; and which, in ſuch caſes, I obſerved, had ſeemed to promote the union of the parts and to moderate the diſcharge. As this mode of treatment is very different from that commonly in uſe, and I have had occaſion to try it in many caſes of bad compound fracture, and other lacerated wounds, in which there has been a tendency to ſphacelus, I have been induced to make it the ſubject of a diſtinct paper, and for this purpoſe have ſelected the following caſes, from a greater number, in which I have uſed it; and theſe, I hope, may be deemed ſufficiently intereſting to procure their inſertion in a future volume of the valuable collection above referred to.

CASE I.

A poor man, named Ingram, aged upwards of eighty years, received an injury on his right foot, from a carriage paſſing over and lacerating it from the inſtep to the toes. The wound had been neglected for ſome days, when I was requeſted by a benevolent gentleman in the neighbourhood to viſit him, and found the foot

ſphacelated as high as the ancle, and the inflammation apparently extending ſtill farther.

I began with ſcarifying different parts of the foot, by which means I gave vent to a conſiderable quantity of acrid ichor. The whole foot was then well covered with lint, continued to ſome diſtance above the diſeaſe, and directed to be kept conſtantly wet with a mixture compoſed of half an ounce of crude ſal ammoniac diſſolved in a pint of vinegar. Internally he took the bark in ſubſtance, liberally, with opium, as he had a diſpoſition to diarrhœa.

On the ſecond day after this mode of treatment had been adopted, I had the ſatisfaction to find that the inflammation had not ſenſibly increaſed, and that the patient felt at intervals a throbbing, but which, he ſaid, was not painful, about the ancles. His pulſe, which had been much quicker, was now at 100.

On the ſixth day, a viſible ſeparation of the morbid parts was diſcoverable, and matter was perceptible on the verge of the ſeparating parts; a fluctuation was felt in ſeveral parts of the foot, particularly beneath thoſe places that had been ſcarified; and upon making deeper inciſions here, we diſcovered a collection of good pus and granulations of new fleſh. In the courſe

courſe of a fortnight, the ſloughs, having previouſly become looſe, were gradually taken away, and the parts expoſed one clear uniform wound. After this the bark was adminiſtered leſs frequently, but the uſe of the lotion was continued till the wound was nearly healed, which happened in about two months.

CASE II.

A girl, aged nineteen years, was attacked by a maſtiff, and had the muſcles of the thigh and leg, particularly the vaſtus externus and gaſtrocnemius ſo violently lacerated, that the worſt conſequences were to be expected from the circulation being cut off in the large veſſels from the extremity, notwithſtanding which ſhe loſt little or no blood; a circumſtance, by the bye, that frequently occurs in lacerated wounds. She ſuffered but little pain, although the ſeparated muſcles of the upper part appeared to be much irritated. The large portions of muſcle yet adhering were cautiouſly replaced as near their original ſituation as the nature of the caſe would admit; and after the parts had been well

bathed with warm vinegar, and due proportions of lint applied round the limb, the whole was encompaſſed with a broad roller, applied merely tight enough to retain the dreſſings; the limb was then laid in an horizontal poſition, and the preſſure taken from the affected part by means of a pillow placed under the lower part of the leg, conſiderably below the injury. The whole was then wet with a lotion compoſed of half an ounce of crude ſal ammoniac diſſolved in a pint of vinegar, and ordered to be kept ſo conſtantly.

The firſt day ſhe was but little ſenſible of the application. At night a draught, containing twenty drops of laudanum, was given, and ſhe reſted well.

On the ſecond day I found her pulſe but little quickened, and her thirſt moderate; ſhe had perfect feeling in every part of the limb, and complained of an acute ſmarting in the wound upon every renewal of the lotion, which continued for a few minutes, and then ſhe became eaſy. An opening draught was given this morning, and ſhe repeated the opiate at night.

On the third day matter ſeemed to be forming,

ing, but there was no appearance of inflammation or ſwelling of the limb.

On the fifth day from the receipt of the injury, the bandage was carefully removed, and I had the ſatisfaction to find that the muſcles had united, and that the parts of the bone that had been laid bare were covered with new fleſh. The diſcharge was kindly, and in moderate quantity, and the limb was free from pain. The ſame mode of dreſſing and the ſame applications were continued without alteration during three weeks, at the end of which time the cure was complete.

CASE III.

A young man, aged nineteen years, by a fall of coal in the pit while he was ſtooping, was preſſed to the ground, and had his thigh broke about four fingers breadth above the patella. The upper part of the bone was forced through the muſcles and into the ground, ſo that the hollow of the bone was filled with dirt, and ſtripped bare nearly four inches, and the muſcles much lacerated. In this ſituation

he was brought home, (about a mile) and I then ſaw him; the wound bled but little.

In this caſe I determined to try the effect of keeping the limb gently extended, nearly at its original length, after taking off ſo much of the bone as I ſhould find requiſite to a complete and exact reduction and to get above the coal ſlack which had been introduced.

As the bone was ſhivered longitudinally, I found it neceſſary to take off about three inches of it. This being done, and the wound well cleanſed with warm vinegar and a ſmall proportion of ſpirit of wine, I placed the lower part of the limb as exactly parallel to the other as poſſible, and retained it in that poſition by means of proper bolſters on each ſide of the limb. An eighteen-tailed bandage having been previouſly laid under the part, the dreſſing was made by gently filling the vacancy (the whole ſide of the leg *externally* being open) with ſoft pledgets of lint dipped in the ſame ſolution as that uſed in the preceding caſe, and the bandage was then applied as gently as poſſible, in order to prevent the fleſh from being preſſed into the part that the bone ought to have occupied; and a ſplint applied externally on each ſide, merely to give more ſteadineſs to the

limb, but without occaſioning much preſſure. I think it right to mention alſo that the middle tails of the bandage were cut ſmaller than the others, and applied in ſuch a manner that the wound might be uncovered, in order that the lotion might be applied immediately to the wound, without diſturbing any other part.

He was let blood, and twenty-five drops of tincture of opium were given at night, and the attendant was ſtrictly enjoined to keep the part conſtantly wet with the ſolution, except only during the intervals of ſleep.

Upon viſiting him the morning after the accident, I found he had had but little ſleep, though his limb had given him but little pain, except for about a quarter of an hour after the application of the lotion, after which he ſaid he had felt the whole leg and foot become ſenſibly warmer. The lower part of the limb lay very ſteady, exactly in the ſituation in which it had been placed; he took this morning three grains of calomel, which procured one ſtool.

On the fifth day, including the day of the receipt of the injury, (there having been ſome appearance of matter between the folds of the bandage) the dreſſings were wholly removed, and the wound was found covered with a well-

concocted

concocted pus in moderate quantity, and with new granulations. The dreſſings were continued in the ſame manner as before, the whole vacancy being carefully filled with doſſils of lint, made as ſoft as poſſible, till the whole was level with the ſkin; and over theſe the bandage was applied as before. He continued to repeat the opiate every night, and the calomel occaſionally; his appetite was tolerably good, he uſed nearly the ſame diet as when in health, and was permitted to drink a ſmall quantity of ale.

On the eighth day the dreſſings were again removed, and the appearances continued to be favourable. From this time, the weather being warm, the wound was dreſſed every day in the ſame manner as at firſt; and in about eight weeks the callus was completely formed, and had filled up the void ſpace, and the wound was reduced to about a quarter of an inch in diameter.

In ten weeks he came down ſtairs, and went about on crutches; and in about ſixteen weeks from the time he received the injury, he went with a ſtick only, and was able to walk nearly two miles. The limb was not quite an inch ſhorter than the other; the ſmall ulcer continued

nued to diſcharge, till a conſiderable exfoliation of bone, which gradually made its way outwards, was extracted, after which the wound ſoon healed.

CASE IV.

A boy, aged about fifteen years, had the misfortune to ſlip his hand under the axletree of a water-wheel, which moves at about the diſtance of two inches and a half from a brick wall or buttreſs ſupporting another building; his arm was taken in to the elbow, and the machine performed ſeveral revolutions on the part before he could be extricated. The fleſh was ſtripped down on each ſide of the thick part of the arm, and the thumb was nearly ſeparated; but the fingers and hand had ſuffered but little, and there was no hæmorrhage. The thumb was not taken off, but carefully replaced, as well as the other muſcular parts that had been ſeparated; and to the whole wound a large quantity of lint was applied, wet with the ſolution of ſal ammoniac in vinegar. He took twenty drops of tincture of opium at night, but

but he was very reſtleſs, and complained much of his arm.

Second day. The arm had bled in the night, and the dreſſings were become ſtiff and hard, which rendered it neceſſary to remove them. The diſturbance this occaſioned produced a degree of inflammation which, I believe, might otherwiſe have been prevented, and which proved the ſource of misfortune. The parts from this time became exceſſively painful, and the inflammation extended to the upper part of the arm, and to the ſhoulder and ſide, as far down as the pectoral muſcle. He was coſtive and feveriſh, and complained much of thirſt. The whole arm was wrapped in a cataplaſm made of oatmeal, with equal parts of vinegar and water; and three grains of calomel were immediately given. Two ſtools were procured by this medicine; but the pains ſtill continued to be very diſtreſſing to him. His pulſe was at 100.

Third day. The above ſymptoms continued; the pulſe was increaſed to 110; and he was at times delirious; the upper parts of the arm, ſhoulder, and ſide, were become of a dark red colour, and were exceedingly tenſe. He had ſeveral looſe ſtools; the arms and ſide were

dreſſed

dreſſed as before, with the addition, in the liquid of which the poultice was made, of half an ounce of crude ſal ammoniac, and an ounce of ſpirit of turpentine. He took half a drachm of Peruvian bark, with fifteen drops of tincture of opium, every third hour; and care was taken to diſtil ſome of the ſolution between the dreſſings, upon the ſhoulder, very often, in ſuch a manner that it might make its way to the affected parts.

Fourth day. I found the whole fore arm, from the elbow, completely ſphacelated and dry; but the ſhoulder and ſide were nearly in the ſame ſtate as yeſterday, the inflammation not having increaſed; his purging had ceaſed; he was not ſo thirſty, and his pulſe was at 100; but he complained much of head-ach and wearineſs. Notwithſtanding there appeared ſome reaſon to conclude that his head-ach might, in ſome meaſure, be occaſioned by the quantity of opium he had taken, I continued the uſe of it in the ſame doſes; a ſtool was procured by means of a clyſter. The uſe of the lotion was continued.

Fifth day. The ſymptoms were nearly the ſame as yeſterday. The ſame dreſſings and medicines were continued.

Sixth

Sixth day. The pain and tenſion were much leſſened he had reſted tol ably well, and was free from thirſt; the ſhoulder and ſide, with a conſiderable part of the upper arm, ſeemed approaching to their natural colour, and the extent of inflammation was viſibly decreaſing. The bark was ſtill continued, but without the tincture of opium, inſtead of which he took two grains of purified opium at night.

The cataplaſm was continued as before for about a week, from this time, when the ſhoulder and ſide having recovered their original tone, it was changed for one compoſed of oatmeal and the ſolution alone. In a few days matter formed plentifully round the bone in thoſe parts where the lacerations had been deep, and large portions of the muſcles were cautiouſly removed. The matter formed was of a good conſiſtence, and moderate in quantity; and the wound was perfectly eaſy, except ng only upon the application of the lotion, and for ſome ſhort time after. The whole hand dropped off at the wriſt; the other parts gradually filled up with good fleſh, and are now completely healed.

CASE

CASE V.

A man, aged thirty-ſix years, by the fall of a very heavy iron rod perpendicularly upon his foot, upon that part where the ſhoe is generally buckled, received a conſiderable lacerated wound, by which the tendons were much injured, and the integuments and muſcular fleſh were ſtripped off from the upper part of the tarſus, and hung in a large looſe flap down the ſide of the foot. The wound bled conſiderably, and the whole foot, from the violence of the blow, was inſenſible. The parts were well cleanſed from the grumous blood with vinegar and water, with a ſmall quantity of ſpirit of wine, and the looſe flap replaced in the ſituation from which it had been torn, and dreſſed with pledgets of lint dipped in the ſolution; and a cataplaſm applied of oatmeal and vinegar.

The morning after the injury, upon removing the dreſſings, the wound and whole foot were found to have a favourable appearance; but at night he began to complain of a great degree of heat, throbbing, and ſenſe of tenſion.

On

On the third day, on removing the dreſſings, the whole upper part of the foot appeared to be haſtily approaching to a ſphacelated ſtate. It had loſt all ſenſibility to the touch, and the inflammation had increaſed, though in ſo ſhort a time, conſiderably above the ancle, and to the extremity of the toes. A ſenſation of burning heat in the whole foot and leg ſtill continued. The parts that were looſe were now removed, and the wound, after having been bathed a conſiderable time with a mixture of warm vinegar and water, with a ſmall quantity of ſal ammoniac previouſly diſſolved in it, was dreſſed as uſual, the lint being firſt well ſaturated with the lotion; and over the whole a cataplaſm was applied as before. A purgative medicine, compoſed of four grains of calomel, and five grains of aloes, was given, which operated well. He paſſed this day with ſomewhat more eaſe, and at night took thirty drops of tincture of opium.

Fourth day. He complained of having paſſed a very reſtleſs night, and that the painful ſenſation of burning heat ſtill continued; the inflammation went on increaſing; his pulſe was at 97, and he had much thirſt and fluſhing heat. Bark, in the quantity of half a drachm,

was

was given every third hour, and twenty drops of tincture of opium every ſixth hour. The ſame dreſſings were continued, with the poultice; but at night the poultice was omitted, and the dreſſings kept wet with the ſolution alone.

Fifth day. He had reſted much better; his thirſt was more tolerable, and the heat and other ſymptoms were much more moderate; his pulſe was at 90; the inflammation had not increaſed; and the tenſion about the ancle was leſſened. The ſame medicines and local applications were continued as laſt night. On renewing the dreſſings in the evening, he complained of having paſſed a very painful afternoon, and that the ſenſe of heat had been greater. He attributed all this to the omiſſion of the poultice, which was now, at his earneſt requeſt, renewed.

Sixth day. In the morning the ſymptoms were much increaſed, and the inflammation was ſpreading, with a violent degree of pain and tenſion, the whole upper part of the foot being in a ſphacelated ſtate; and the patient complained of exceſſive pain. The ſame dreſſings as before were applied, but without the poultice, after bathing the parts with warm vinegar; a broad roller, for the convenience of

keeping the parts wet, was gently applied over all the inflamed parts; and as I had a ſuſpicion that the increaſe of his pain, &c. yeſterday, if not wholly, was, in a great meaſure, owing rather to a want of due care in keeping the parts conſtantly moiſt, and thus ſuffering them to get dry and hard, than to any effect the application could have in producing thoſe ſymptoms, I paid this day a particular attention to this circumſtance, by viſiting him ſeveral times, to ſee that the ſolution was duly applied; and in a few hours the ſymptoms of pain and heat in the whole limb were greatly diminiſhed, and continued gradually to abate the whole day His pulſe at night was at 93.

Seventh day. The ſymptoms were nearly the ſame as yeſterday; the inflammation, upon the whole, was rather leſs, but there was no appearance of matter. He had paſſed a tolerable night; but his pulſe was ſtill at 93. As he was coſtive, the purgative medicine was repeated.

Eighth day. He had paſt a good night, comparatively ſpeaking; the pain in the upper part of the limb (or above the diſeaſe) was conſiderably leſſened, and the inflammation was much leſs; a ſmall quantity of matter appeared upon the edges of the lacerated parts;

his pulſe was at 90. He began to complain of ſevere ſmarting upon the renewal of the lotion, and at times inſiſted on its application being deferred to longer intervals, though when the parts began to grow dry, the heat and ſenſe of ſtricture were conſtantly renewed.

Ninth day. He had paſſed a reſtleſs and painful night; his foot and leg were in much pain at intervals, but (excluſive of the ſmarting pain for a quarter of an hour upon the lotion being applied) he always became much eaſier after the wetting of the parts, which took place once in about two hours, unleſs ſleep intervened.

From this time the uſe of the lotion was continued in the ſame manner as before, and he continued alſo to perſevere in the uſe of the bark and opium; the ſloughs ſeparated kindly; the inflammation went off from the leg and toes, and a ſeparation of the diſeaſed parts took place at a very little diſtance from the edges of the original injury. The wound diſcharged a well-formed matter, and as the parts beneath ſome of the thickeſt ſloughs granulated, the latter gradually came away without much pain, and the whole was healed in ten weeks, except a very ſmall ulcer upon the lower part

of the Tarſus, through which a ſmall exfoliation made its way.

As in the preceding caſes I was careful to obviate the effects of irritation, by keeping the bowels moderately open, giving occaſionally, and ſometimes liberally, of opium; and invigorating the ſyſtem by means of wine and the Peruvian bark; it may perhaps be ſuggeſted, by ſome readers, that the favourable termination of the caſes I have been relating was due rather to the internal than external remedies employed; and that to ſubject to a fair and deciſive trial this or any other remedy, no other ſhould be employed at the ſame time. This is indeed what I have done in ſlighter caſes of laceration, where local applications only were requiſite; and in all ſuch caſes the union of the parts has appeared to me to be much more ſpeedily effected by means of the lotion, than it is by the ordinary mode of treatment. And I am able to recollect no inſtance of bad compound fracture, or of lacerated wounds, attended with or threatening ſphacelus, where the warm fomentations and cataplaſms commonly employed in ſuch caſes were

were made uſe of, in which there was any ſuch obviouſly good effect from the local treatment, as in the caſes I have been deſcribing; notwithſtanding there was the ſame liberal uſe of opium and Peruvian bark, &c. internally. On the contrary, I have but too often ſeen the worſt effects from ſuch cataplaſms, &c.; and in one of the above caſes, (Caſe V.), the bad effects of a poultice, applied at the earneſt requeſt of the patient, were very ſtriking, when contraſted with the relief he afterwards experienced from the uſe of the lotion.

III. *Caſe of a diſeaſed Kidney. By the ſame.*

A SEAMAN, forty years old, of a plethoric habit, applied to me at Port Royal, in Jamaica, in 1782, with complaints nearly as follow:

A conſtant aching, and ſometimes acute pain, about the region of the right kidney, attended with a numbneſs of that ſide, and pricking

pains along the urethra, particularly when he paſſed his urine; frequent inclination to make water, ſometimes without ability to void any, and never voiding it but in ſmall quantity; the urine itſelf being high coloured, depoſiting a gritty lateritious ſediment, ſmelling very ſtrong, and forming a film on its ſurface, which approached to a yellow colour. He complained likewiſe of a ſenſe of fulneſs and heat at the neck of the bladder and about the perinæum, and could get but little reſt in any other than an horizontal poſture. He was coſtive, and had frequent naufea.

As he had a full pulſe, ten ounces of blood were taken from the arm, and a purging draught was adminiſtered; after which he took occaſional doſes of a mixture, the principal ingredients of which were diuretic ſalt and tincture of opium.

In the courſe of two or three days his pain was much alleviated, but the difficulty with which he voided his urine ſtill continued.

He now complained of frequent and painful erections, more eſpecially when an inclination to make water came on; he had likewiſe profuſe colliquative ſweats, and was coſtive.

Care was taken to obviate this diſpoſition to coſtive-

coſtiveneſs, by means of purgative medicines and clyſters. Opium was now more liberally adminiſtered, and recourſe was occaſionally had to the warm bath. This laſt produced a certain degree of eaſe while he remained in it, but the ſenſe of ſtricture about the neck of the bladder continued, and the quantity of urine he was able to void ſeemed every day to become leſs, ſo that at the end of a fortnight it was deemed neceſſary to make uſe of the catheter, as he was unable to paſs a ſingle drop of urine without it.

By means of this inſtrument, from four to ſix ounces of turbid urine were drawn off twice a day. He had now much fever, and the pain about the neck of the bladder was become very acute, and ſeemed to affect him ſpaſmodically, as well after as previouſly to the introduction of the catheter. He was likewiſe frequently ſeized with violent pain, which began in his ſhoulders, and proceeded along the right ſide to the hip.

About a month after the firſt uſe of the catheter, he complained of a pain in the urethra, near the ſeat of the proſtate gland, particularly when the inſtrument was paſſing; and

at times the catheter ſeemed to meet with ſome reſiſtance at that part.

From this circumſtance, together with the continuance of the pain in that and the neighbouring parts, and the frequent diſcharge of drops of a mucous conſiſtence from the urethra, we were inclined to think that the principal ſeat of the diſeaſe was in the proſtate gland, (eſpecially as no appearance of calculus had been obſerved), when a freſh ſet of ſymptoms directed our attention more particularly to the right kidney.

Theſe ſymptoms conſiſted in a pain about the region of that kidney which he had before ſcarcely mentioned, but which now (about ſeven weeks after he firſt made his complaints known) was, at times, very ſevere. His ſhoulders alſo, but particularly the right, were ſore, and at intervals acutely painful; the inguinal and axillary glands became ſwelled, and ſore to the touch; and he complained frequently of a ſenſe of coldneſs in the direction of the right ureter, which was ſucceeded by a painful inclination to make water.

From theſe circumſtances it was ſuſpected that the right kidney, if not the chief ſource of the extraordinary ſymptoms I have been deſcribing,

deſcribing, had at leaſt ſuffered conſiderably. He was therefore urged to recollect any external injury he might have received. After a little heſitation he informed us, that about a month previouſly to his firſt applying for relief, he had received ſeveral violent blows from the end of a large rope acroſs his loins, which for ſome time had given him conſiderable uneaſineſs. In the courſe of a few days, however, he ſaid, the pain had gone off, but had returned at intervals; and as he had ſuffered much, at different times, from gravel, he had aſcribed his preſent complaints to that cauſe.

At the time he made known theſe particulars, he was in a very reduced condition; his ſtomach was become ſo extremely irritable, that it retained but little of what was given to him either of food or medicine; and about a week afterwards he died.

On diſſection the urethra was found to be in a healthy ſtate, but the proſtate gland was a little enlarged. The bladder contained about eight ounces of turbid urine, mixed with a purulent fluid, very offenſive to the ſmell. The right ureter was much enlarged, and filled with the ſame kind of fœtid matter. The kidney

ney on the ſame ſide was enlarged nearly to thrice its natural ſize, and on being opened was found to be in a ſtate of ſuppuration, and to contain a conſiderable quantity of fœtid pus, ſo that the internal ſubſtance of the kidney was in a great meaſure deſtroyed.

There was no appearance of calculus; and the other kidney, as well as the reſt of the abdominal viſcera, appeared to be in a natural ſtate.

It may be doubted, perhaps, whether the affection of the kidney, in this caſe, ought ſolely to be attributed to the effects of the blows that were inflicted; but allowing the kidney to have been previouſly diſeaſed (and the complaints the patient had already experienced, and which he attributed to gravel, render it not improbable that it was ſo); ſtill there can, I think, be no doubt that the ſuppurative proceſs which took place was haſtened, if not immediately occaſioned, by external violence. And of ſuppuration of the kidnies from external injury, in any reſpect ſimilar to the preſent, I have been able to meet with no example in books. Different ſyſtematic writers do indeed enume-

enumerate external contuſion among the remote cauſes of nephritis, but I do not find, in any of them, an inſtance of ſuch an affection from ſuch a ſource; ſo that I flatter myſelf the caſe I have related will be thought worthy of being recorded.

It ſhows that a frequent inclination, without ability, to make water, is not always occaſioned by gravel or calculous concretions; and it affords a ſtriking inſtance of the influence an organ like the kidney may have upon parts not only contiguous to, but even remote from the ſeat of diſeaſe.

IV. *Caſe of a Gun-Shot Wound of the Head. By the ſame.*

A HESSIAN grenadier, aged between thirty and forty years, being one of a detachment ſent to reduce a fort on the banks of the

the Delawar, in the act of levelling his piece, received a ball (grape ſhot) on that part of the os frontis which forms the external canthus of the eye. The ball making its paſſage through the head, came out under and rather behind the oppoſite ear, as in the annexed plate *.

What were the immediate effects upon the receipt of the injury I am not able to ſay, not being immediately upon the ſpot; but he appeared, when brought to the regimental hoſpital, to have a perfect recollection of every circumſtance that had occurred to him, except only for a ſhort time after he fell. He complained of little pain, and did not appear to have loſt ſo much blood as might have been expected.

The ball being a ſpent one, had much ſplintered the cranium, both at its entrance and exit; and was found in the folds of his coat collar.

The wounds being cleanſed, and the ſplinters of bone removed, as far as was practicable, from about the external parts, ſuitable

* See Plate I. Fig. 1. in which *a* refers to the entrance of the ball, and *b* to the part where it paſſed out.

dreſſings

Medical Facts & Obs Vol. VI.Pl. I.

dreſſings were applied; and his pulſe being full, he was let blood; after which he took twenty-five drops of tincture of opium. The next day he had a ſenſe of heavineſs over his eyes, and obſerved that objects did not appear to him ſo brilliant as uſual; towards the evening he complained of nauſea and thirſt. He took *tart. vitriol.* and *antim. diaph.* āā gr. xii every third hour, and a clyſter was adminiſtered. On the third day he complained of pain of his head, accompanied with drowſineſs; and, at intervals, of a weakneſs of his extremities. As the clyſters had failed to procure a ſufficient diſcharge of fæces, he was directed to take three grains of calomel and fifteen grains of powder of jalap, which operated well, and procured an alleviation of the ſymptoms juſt now mentioned. His eyes were but ſlightly inflamed, and he complained of but little pain in that on the affected ſide.

On the 6th day there was a good diſcharge of matter from the wound, and eſcars began to ſeparate in pretty large ſloughs. From this time he reſted tolerably well without the uſe of the opiate, which till now had been repeated at bed-time. Splinters of bone, that had been driven in at the ſuperior wound by the ball, came away

away from the dependent orifice at almoſt every dreſſing (which was twice a day) for ſeveral days. The nauſea, head-ach, weakneſs of his limbs, thirſt, and every ſymptom of fever, gradually vaniſhed; the ſuperior orifice filled up with new granulations, and cicatrized firmly; and in about ten weeks there remained nothing more neceſſary than a ſuperficial dreſſing to the inferior opening near the ear.

I did not ſee this man after he had actually left off every application to the affected part; but from the condition of the wound, and the patient's health and vigour, I have not any room to doubt, that in a few days, after I laſt ſaw him, he was capable of returning to his duty.

On reflecting on this extraordinary injury, (inaſmuch as it was not a mortal one) I am inclined to think, that as the ball, though a large one, entered low down upon the orbit, and near the external part of the eye, it miſſed the os planum and frontal ſinuſes, and conſequently that branch of nerves that paſſes through them; ſo that, judging from its apparent direction, it muſt have injured part of the os ethmoides, near the ſeptum naſi. To this courſe of the ball,

ball, and the favourable ſituation of the dependent orifice, the favourable event of the caſe was probably owing; for though he complained at certain periods of a ſenſe of weight upon the upper and fore part of the head, general weakneſs of his limbs, and loſs of ſight, ſymptoms indicating an oppreſſion of the brain, yet upon opening the wound, and giving vent to the matter, which was in ſome meaſure confined by the dreſſings, thoſe ſymptoms gradually vaniſhed, and the patient always became perfectly eaſy after the application, for a few minutes, of a warm fomentation.

An inſtance of a ball entering under the right eye, and paſſing obliquely through the cerebrum and cranium above the right ear, without hurting the eye or ſight, is recorded by Heiſter in his Medical, Chirurgical, and Anatomical Caſes and Obſervations, page 7 (of the Engliſh tranſlation) Obſ. VII.

V. *An Account of ſome extraordinary Symptoms which were apparently connected with certain morbid Alterations about the Veins and Nerves. Communicated in a Letter to Dr.* Simmons *by Mr.* John Pearſon, *Surgeon of the Lock Hoſpital, and of the Public Diſpenſary.*

MRS. P. aged fifty-one years, of Miles' Lane, Cannon Street, began to ſuffer from a peculiar uneaſineſs at the inner part of her left leg, about ſeventeen years ago, when ſhe was in the third month of her ſecond pregnancy. The ſkin which covered the particular ſeat of her complaint, retained its natural colour; but there was a circular induration, of about half an inch in diameter, very little elevated above the ſurface, which was exquiſitely painful when ſlightly touched or compreſſed; this morbid part was ſituated in the courſe of the vena ſaphena major, and was about ſix inches above the joint of the ancle. Beſides the acute pain which was produced by inadvertently touching this little tumour, Mrs. P. commonly ſuffered ſeveral paroxyſms of

of pain every day; each of theſe attacks was accompanied with an increaſed redneſs, and a ſenſible elevation of the indurated part, the pain at the ſame time extending to the knee, and often darting to the ſtomach; the duration of the fit was about twenty minutes; it was attended with ſlight convulſive motions of different parts of the body, and frequently terminated with flatulent eructations. Theſe fits of pain did not recur at any regular periods; ſo that the number which ſhe underwent in the courſe of a day was various and uncertain; for a diſordered ſtate of the ſtomach, or a ſudden perturbation of mind would at any time excite one of the paroxyſms. She alſo had obſerved, that the ſeverity of her ſufferings was invariably increaſed during the periods of menſtruation and of pregnancy; and that in the latter months of geſtation, the duration of each recurrence of pain was extended to an hour and a half. But although this diſeaſe was uniformly aggravated by certain alterations in the ſtate of the uterus, yet it continued with undiminiſhed ſeverity after Mrs. P. had ceaſed to bear children; for when her youngeſt child was more than ſix years old, ſhe had not experienced any abatement of her daily ſufferings. About thir-

teen years ago, I adviſed her to have the morbid part removed; but at that time ſhe was unwilling to undergo an operation; ſhe however ſubmitted to various methods of treatment, under the direction of different medical gentlemen, but without obtaining any relief.

In the month of April, 1793, Dr. Lowder, who had been long acquainted with the circumſtances of this painful complaint, informed Mrs. P. of the ſucceſs which had attended the removal of a ſimilar tumour, by the application of a cauſtic. She read the hiſtory of the caſe, which is publiſhed in the third volume of the Memoirs of the Medical Society of London, and very ſoon determined to ſeek relief from the ſame mode of treatment.

Accordingly, on the 22d of April, I applied the lapis infernalis to the morbid part; ſhe endured the moſt excruciating tortures during ſeveral minutes after its application; but the pain gradually diminiſhed with the ſenſibility of the part, ſo that in about twenty minutes the eſchar was completely formed, and ſhe then felt no more pain than what is the uſual conſequence of a cauſtic applied to any part of the body. From this day ſhe never experienced the recurrence of a ſingle paroxyſm of pain; the eſchar

exfoliated in about twelve days; and on the 7th of June the ſore was perfectly healed.

As the preceding hiſtory contains ſome curious and rather uncommon circumſtances, I beg leave to offer a few obſervations upon ſome of them. The indurated part having been deſtroyed by a cauſtic, it was not in my power to examine its internal ſtructure, ſo as to diſcover the true nature of the morbid alteration. I aſcertained, however, that a portion of the vena ſaphena major, and that branch of the crural nerve which accompanies it in its courſe down the inſide of the leg, were completely included within this tumour. This fact was clearly demonſtrated after the exfoliation of the eſchar; for I then ſaw a portion of the vein hanging down at the ſuperior part of the ſore, and the naked nerve in contact with it; and on touching the nerve with my probe, Mrs. P. inſtantly complained of an acutely painful ſenſation, ſimilar to that which ſhe had been accuſtomed to feel before the tumour was removed. I then deſtroyed that part of the nerve which was expoſed with lunar cauſtic, and my patient ſuffered no more uneaſineſs. After thus proving

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that a vein, and a conſiderable ramification of a nerve, were contained within the diſeaſed part, I proceed to obſerve, that the paroxyſms of pain were excited by every thing that accelerated or otherwiſe diſturbed the circulation of the blood; whether applied to the induration, or affecting the general ſyſtem; as all ſtrong exertions of the muſcles, external impulſe, or mental commotion. The aſcent of the blood, in the veins of the lower extremities, is neceſſarily impeded in the ſtate of pregnancy; and during this period, the fits of pain were always ſharper, and were alſo of longer duration; and at the time of parturition, when the action of the heart and blood-veſſels is conſiderably increaſed, Mrs. P. ſuffered exceedingly; for, to uſe her own expreſſion, ſhe "had all her labour pains in her leg."

It is alſo highly probable, that the portion of vein which paſſed through the tumour was unuſually diſtended with blood at the time of the paroxyſm; for upon theſe occaſions, the morbid ſurface became redder than common; and the tumour was ſenſibly elevated. We may therefore, perhaps, venture to conclude, that the vein and the nerve being confined within a ſubſtance that could not be eaſily diſtended, whenever

ever the vein became preternaturally turgid, the nerve was compreſſed between its parietes and the internal ſurface of the induration; and that conſequently the ſymptoms were connected with this ſtate of the part. I do not ſuppoſe that it will be neceſſary for me to undertake a proof in detail, that a certain degree of preſſure upon a nerve will produce pain, ſpaſms, and convulſions; it may be ſufficient for my purpoſe to refer to a few of the many inſtances which are recorded in medical books. In the fourth volume of the Edinburgh Medical Eſſays, Dr. Short has related the hiſtory of an epilepſy, which was cauſed by the preſſure of a hard cartilaginous ſubſtance upon a nerve; he cured his patient by removing the tumour, and dividing the nerve. Guattani, in his Treatiſe *de externis Aneuryſmatibus*, (Hiſt. XX.) has recorded a caſe in which violent ſpaſms were occaſioned by the preſſure of an aneuriſm upon a nerve. In the Eſſays and Obſervations Phyſical and Literary, Vol. III., the late Sir John Pringle has publiſhed a Caſe, where a tumour formed by extravaſated blood, by preſſing upon the intercoſtal nerves, produced pain, irritation, and perhaps a hic-

cup, which could not be ſtopped*. I do not intend to deduce any general concluſion from a particular inſtance; for although the remarkable ſymptoms which occurred in Mrs. P.'s caſe, were connected with a morbid ſtate of a vein and a nerve; yet as no account has been publiſhed of the internal ſtructure of parts which have been affected by a ſimilar complaint, it would be improper to conclude, that every inſtance of local morbid ſenſibility, accompanied with convulſive motions and pain, muſt depend upon ſuch a peculiar condition of the ſuffering parts. I have indeed ſeen another caſe, very much reſembling that of Mrs. P.'s, in which there is a ſmall exquiſitely ſenſible induration

* For inſtances of convulſive motions, and even epilepſy, produced by local diſeaſes about ſome of the extremities, or that were cured by the removal of matter, carious bone, or ſome portion of the integuments, conſult Willis *de Morbis Convulſ.*; Riverius *de Epilepſia*; Schenckii *Obſervat.* (Lib. *de Epilepſia.*); Foreſtus *de Cerebri Morbis*, Lib. X. Obſ. 67; Petri Borelli *Hiſtor. & Obſervat. medico phyſicarum*, Cent. II. Obſ. 95. Joh. Rhodii *Obſerv. Med.* Cent. I.; Tulpii *Obſerv. Med.* Lib. IV. Cap. 2; Boneti *Sepulchretum*, Lib. I. Sect. 13; Van Swieten *Comment. in Aph.* H. Boerhaave, Tom. III. § 1075. Haller *Elementa Phyſiologiæ*, Tom. IV. § 30. Simſon on the Vital and Animal Actions, Eſſay I. ch. 3.

at

at the posterior part of the leg, near the beginning of the tendo achillis, from which the patient suffers acutely whenever it is touched. She has occasional paroxysms of pain, but they return at uncertain intervals; and she thinks that they grow milder. In this instance, as in that recorded by Dr. Biffet *, the tumour becomes uneasy in rainy and windy weather; but it does not appear that the disease had ever any connexion with pregnancy. I suspect that the tumour, which I have just now mentioned, may be connected with the vena saphena minor, and that consequently it may include or compress a small branch of the sciatic nerve; but as I could not render the cutaneous veins of the leg turgid by moderate pressure, its exact situation was not ascertained †.

In

* Memoirs of the Medical Society of London, Vol. III. Art. VI.

† The first volume of M. Pouteau's posthumous works contains a very curious history of a disease which he there calls cancerous; whether properly or no I shall not inquire; but as it resembles Mrs. P.'s case in some of its characters, I shall take the liberty of presenting an abstract of it:

" On voyoit à la partie basse du *Sternum* une surface " ovale de largeur d'un ecu de six livres dans son petit dia-

In the early part of the laſt Spring, a young married woman applied to me at the Public Diſpenſary, complaining of pain and lameneſs of the right arm. She ſhewed me a tumour of a pale red colour, and of about the ſize of a filberd,

" metre, ſans élévation, ſans rougeur, ſans engorgement " circonvoiſin. La peau ſeulement qui la recouvroit étoit " un peu moins nette, que par tout ailleurs, mais ſemblable " à la ſenſitive qui paroit craindre la main qui l'approche. " Cette portion des tégumens auroit fait reſſentir les plus " vives douleurs, ſi le doigt, ſans la toucher, en eût ap- " proché avec trop de célérité. Le moindre inſecte, un " fetu que le haſard auroit fait poſer deſſus, euſſent auſſi- " tôt rappellé les convulſions. Les rétours de ces convul- " ſions étoient periodiques, ſe montrant à ſept heures & " demie préciſes du ſoir. Dans le plus grand calme, on ne " les attendoit que de deux jours l'un ; & à la moindre agita- " tion, les mouvemens convulſifs étoient journaliers. Leur " durée étoit de deux heures, & même plus." The hiſtory preſents us with many other extraordinary circumſtances; but it may be ſufficient at this time to add, that M. Pouteau made a crucial inciſion in this morbidly ſenſible part, which afforded an immediate although but a temporary ſuſpenſion of the pain and convulſions. He then extirpated the portion of diſeaſed integuments ; but as the young lady was not perfectly relieved by this operation, he finally completed the cure by burning a cylinder of cotton upon the part. Vide *Oeuvres poſthumes de M. Pouteau*, Tom. I. ch. 1.

which

which was ſituated in the courſe of the vena mediana baſilica, at the bend of the arm: this morbid part was conſtantly uneaſy; but when it was preſſed or handled, ſhe complained of acute pain, which extended along the upper arm, and produced ſlight convulſive motions in the muſcles. She derived no advantage from mild diſcutient and emollient applications; but her pain increaſed ſo much, that her health became injured, and ſhe was at length confined to her bed. On viſiting her at home, I found the tumour unaltered in its appearance, excepting a ſpontaneous ſeparation of the cuticle from its ſurface; ſhe was in conſtant pain; the uneaſineſs not only proceeding along the upper arm, but alſo to the neck, and affecting the breaſt and muſcles on the right ſide. Her pulſe was feeble, but not too frequent; ſhe complained of a great ſenſe of weakneſs, and convulſive motions were excited in the muſcles of the upper arm, neck, and thorax, on that ſide, by the gentleſt examination of the morbid part. I ordered a large veſicatory to be applied on the inner part of the fore arm, and directed her to take ten grains of *pulvis ipecacuanhæ compoſitus*, whenever her pain ſhould be unuſually ſevere. She ſoon derived conſiderable relief from this mode

of

of treatment: the bliſtering plaſter was repeated twice during my attendance; the tumour gradually became leſs painful, and diminiſhed in bulk; and in about a month it had entirely diſappeared. It was not more than three weeks after ſhe was diſmiſſed, when ſhe applied to me again, on account of a tumour very much reſembling the former one, which was ſituated at the bend of the arm, in the courſe of the vena cephalica; ſo that a portion of the vein evidently paſſed through, or, rather, was included within the center of the morbid part. The pain and morbid irritability affected the ſame parts as before, but in a much inferior degree. I directed a mode of treatment ſimilar to that which had been employed on the former occaſion, and it was attended with equal ſucceſs.

This young woman had ſome ſymptoms which indicated a diſeaſed ſtate of the lungs; and ſhe occaſionally ſpat blood: but ſhe had not been formerly ſubject to any particular complaints; ſhe menſtruated regularly; and had never been pregnant. I cannot aſſign any probable cauſe for the appearance of ſo ſingular a complaint as that which I have now deſcribed; but ſome of the effects which took place would perhaps

perhaps admit of an explanation, if it could be proved that a ſmall ramification of a nerve, as well as a portion of a vein, were included within each of the tumours. That this was actually the caſe is highly probable, becauſe the cutaneous nerve diſtributes ſeveral of its branches in the vicinity of the vena mediana baſilica; and ſmall fibrils belonging to the muſculo-cutaneous nerve, are commonly ſeen near the vena cephalica, and the vena mediana cephalica; ſo that tumours ſituated at the bend of the arm, and in the courſe of theſe blood veſſels, muſt be almoſt neceſſarily in contact with one or more branches belonging to the internal, or external cutaneous nerves *.

* The late Profeſſor Camper, in a valuable work entitled *Demonſtrationum Anatomico-Pathologicarum Liber primus continens Brachii humani Fabricam et Morbos*, has given a very diſtinct view of the mode in which theſe ſmall branches of nerves are diſtributed at the bend of the arm; and his engravings are accompanied with ſome good practical obſervations. Mr. Abernethy alſo publiſhed two engravings, laſt year, in the ſecond part of his Surgical and Phyſiological Eſſays, in which the courſe of theſe nerves is very neatly and correctly delineated: and the eſſay to which they are annexed, contains many uſeful remarks "on the ill conſequences ſometimes ſucceeding to venæ-"ſection."

I beg

I beg leave to refer it to the intelligent reader, how far the following account of a diſeaſe of the ſubcutaneous nerves, as deſcribed by Profeſſor Camper in the work already referred to, bears any reſemblance to the preceding hiſtories.

" Non raro in nervis cutaneis tubercula par-
" va ac dura obſervantur, quæ vera ganglia
" ſunt, piſi magnitudinem licet non excedant;
" dies tamen nocteſque acutiſſimis lancinanti-
" bus doloribus ægros torquent: externis re-
" mediis non cedunt; ſcalpello igitur ea attin-
" gere oportet. Franequeræ ex cubito feminæ
" tale, plagâ factâ, ſuſtuli, quod ramo muſculo-
" cutanei nervi adhærebat: poſt operationem
" optime ſe habuit. In ſubcutaneis nervis fre-
" quenter eſſe videntur. Amſtelædami ſimile
" ganglium genu mulieris occupans, eodem
" modo ſanari curavi. In viris plus ſemel ea
" vidi: albicant intus, cartilagineæ duritiæ
" ſunt, renitentia, & intra nervorum tunicas
" ſedem habent." Lib. I. P. 11. Cap. 2. § 5.

I have ſeen many ſymptoms reſembling thoſe which occurred in the preceding caſes, apparently follow, as conſequences of wounds inflicted on ſmall branches of nerves; but as this paper is already much longer than I expected it would have been, I muſt defer giving an account

count of them to another opportunity. As the following caſe exhibits ſome uncommon circumſtances, I inſert it as a kind of ſupplement to the foregoing hiſtories.

" The ſingular effects of an iſſue in the in-
" ſide of the thigh, which appeared in the caſe
" of a clergyman; written by himſelf, Auguſt
" 25th, 1793.

" The Rev. Dr. T——, of Knightſbridge,
" above 60 years of age, having had a hint
" from a medical friend, that an iſſue might be
" of uſe to his health, he had one made by a
" bliſter, in the lower part and at the inſide
" of his right thigh, about the end of May laſt.
" Two days after the pea was put in, he was
" ſeized with a ſickneſs and vomiting, which
" continued ſeveral hours. In about ſix days
" after this firſt attack, he had a return of the
" ſame ſymptoms; and theſe fits recurred every
" ſix or ſeven days. But what is very remark-
" able, when the iſſue began to diſcharge, he
" became deaf in both his ears, and the deaf-
" neſs arrived to ſuch a degree, that in preach-
" ing he could but juſt hear his own voice.

" After the iſſue had been kept open ſix
" weeks, it occurred to him, that perhaps the
" regular fits of ſickneſs and vomiting, and the
" unuſual

" unuſual deafneſs, (both of which he recol-
" lected had commenced with the iſſue) were
" occaſioned by a ſympathy of the nerves; and
" having made obſervations for one week longer,
" which confirmed this opinion, he determined
" to dry it up. This he did gradually, by uſing
" peaſe of a ſmaller ſize, till the ulcer was not
" more than one eighth of an inch in diameter.
" When the pea had been out only twelve hours,
" he was ſenſible of ſome ſmall return of his
" hearing, and on looking at the ſore, he found
" it healed; which he conſidered as a farther
" confirmation of his opinion, reſpecting the
" cauſe of his deafneſs, as well as of the ſickneſs
" and vomiting. He found, that as the wound
" healed, the deafneſs leſſened, and when it was
" completely healed, his hearing was quite reco-
" vered, nor has he had one fit of ſickneſs ſince."

When Dr. T—— related his caſe to me, I deſired him to let me ſee the cicatrix of the iſſue; and on carefully examining it, it appeared probable that the pea had preſſed againſt the ſide of the vena ſaphena. I would alſo farther add, that my examination of the part excited a ſlight degree of nauſea.

VI. *An*

VI. *An Account of the Extraction of an extraneous Subſtance from the Rectum. By Mr.* William Blair, *Surgeon of the Lock Hoſpital; and of the General Diſpenſary in Newman Street, St. Mary-le-bone.*

ON Tueſday, the 25th of March laſt, a French gentleman was ſent to me by an Apothecary in this neighbourhood, complaining of a pungent, hot, and irritating ſenſation in the *rectum*; which was conſiderably augmented during every evacuation *per anum*. Theſe painful ſymptoms had commenced on the preceding Sunday, and continued to encreaſe in ſo alarming a manner, that, upon the day following, he was induced to examine with his finger, whether or not any foreign ſubſtance, or other cauſe of his uneaſineſs, could be diſcovered in the inteſtine. He had the good fortune to feel ſomething in the rectum, which he thought was unnatural, but could not remove it; and therefore he applied the next day for chirurgical aſſiſtance.

Having ſubmitted the patient to a proper examination, I readily perceived an hard body confined in the interior membrane of the inteſtine. With the help of a pair of forceps, I extracted

extracted two portions of a brittle black substance; which, on careful inspection, appeared to be bread toasted nearly to a cinder: the two pieces, which were whole before the extraction was attempted, might be together about an inch in length, half an inch in width, and one third of an inch in diameter.

The patient remembered to have swallowed something with considerable difficulty two days before, while partaking of some soup; which was probably the same morsel of bread that distressed him upon this occasion.

Does it not appear from this case, that bread when toasted is less fit for digestion than some persons would have us believe; and that it affords but little nourishment compared with that which is moderately baked?

However trifling the circumstances of the above case may be regarded in its earliest stage; there can be no doubt entertained of the probability of its terminating very seriously, if the patient had not applied for speedy relief: inflammation, abscess, and all their consequences, might have ensued, if the efforts of nature, or the power of aperient and antiphlogistic remedies had alone been trusted to.

In similar instances, without losing time by endeavours

endeavours to relieve the patient's ſufferings by medicine, it will be immediately proper to ſubject him to a careful examination. If the ſimple introduction of a finger be inſufficient to diſengage the extraneous body, and it can be felt adhering to the *rugæ*, or piercing the coats of the rectum, a pair of blunt-pointed ſciſſars, or forceps, (as the caſe may indicate) ſhould be gently conducted upon the finger, in order to divide, break in pieces, or looſen the foreign ſubſtance: if a pointed bone, or other hard and ſharp body, ſhould be confined acroſs the gut, endangering the neighbouring parts, it will be prudent to empty the urinary bladder, previous to any attempt to remove it by mechanical means: and, ſhould the pain, and other ill effects become urgent, it might be neceſſary, after milder methods had proved ineffectual, to make a judicious inciſion either into the rectum, or circumjacent integuments, as the peculiarities of the caſe ſhould require to facilitate the extraction. To obviate the inflammation, and its concomitant ſymptoms, leeches, anodyne and laxative clyſters, with the uſual antiphlogiſtic remedies, ought to be diligently employed.

Inſtances of the kind above related, with

ſuitable remarks, are recorded by ſeveral practical authors; but the reader may ſpare himſelf the trouble of peruſing ſome of them, by conſulting the *Memoires de l'Académie Royale de Chirurgie*, Tom. I. p. 540, et ſeq. 4to Edit.

Newman Street, Oct. 6, 1794.

VII. *A Caſe of Aneuriſm of the Crural Artery; communicated in a Letter to Dr.* Simmons, *by Mr.* Thompſon Forſter, *Surgeon on the Staff of the Army, and Surgeon to Guy's Hoſpital.*

TO DR. SIMMONS.

Dear Sir,

TO the two caſes of Aneuriſm which you have done me the honour to inſert in the fifth volume of Medical Facts and Obſervations, I am deſirous of adding the following, as I flatter myſelf it will tend ſtill further to elucidate the peculiar utility and advantages of the operation in queſtion.

Believe me, Dear Sir,

Your's, &c.

Nov. 3, 1794. THOMPSON FORSTER.

CASE.

CASE.

Lawrence M'Carthy, a labouring man, aged thirty-ſeven years, was admitted, as my patient, into Guy's Hoſpital, on the 30th of July 1794, for the cure of an aneuriſm of the crural artery.

About nine months before his admiſſion, he had perceived a ſmall tumor on his right thigh, near that part where the crural artery dips under the triceps muſcle; as it occaſioned no inconvenience, nor prevented his working, he took but little notice of it; it came ſpontaneouſly, without any external violence, and remained ſtationary for near ſix months before it became painful: when the tumor had acquired the ſize of an egg, a pulſation was perceptible in it, but not before.

At this period of the diſeaſe he was adviſed to foment the part, and to make uſe of liniments: this he continued to do for ſome time; but finding no relief from theſe remedies, he applied to a ſurgeon, who recommended the uſe of a bandage, which he made uſe of for near three months, but without any abatement of the pain; and the tumor in the mean time had increaſed to a very conſiderable

ſize, and the limb in general had acquired ſomething more than its natural bulk.

The patient, naturally hypochondriacal, became anxious, irritable, and dejected; complaining of great pain in the limb, and particularly in the tumor, which was in ſome meaſure eaſed by preſſure. In this ſtate he came into the hoſpital; and his general habit having been lowered by bleeding, purgatives, and a ſuitable regimen previouſly to the operation, I performed it on Monday, the 11th of Auguſt, by making an inciſion in the courſe of the lower edge of the ſartorius muſcle, and about an inch below where the profunda is uſually given off. Having laid bare the artery, * I paſſed a ligature under it with an eyed probe, and applying the ſtick, ſurrounded by adheſive plaſter, &c. as deſcribed in the former caſes †, the ar-

* With a view of conveying to the reader a more preciſe idea of the operation, I have made a ſketch of the parts concerned in it, from a ſubject diſſected for the purpoſe. See the annexed engraving (plate 1, fig. 2.) in which *a* refers to Poupart's ligament; *b* to the crural artery, with a ligature paſſed under it at the part where it was tied; *c* to the profunda; and *d* to the ſartorius muſcle. It ſeems hardly neceſſary to remind the reader that the object of this ſketch being merely to point out the ſeat of the operation, the parts are delineated in their natural ſtate.

† Vide Vol. V. p. 6.

tery

tery was thus ſurrounded, and by theſe means equally compreſſed; the pulſation below of courſe ceaſed: but, for fear of a ſudden hæmorrhage, I paſſed a ſecond ligature about half an inch above the former, laying it looſe, that an aſſiſtant might inſtantly tie it in caſe of ſuch an accident.

Auguſt 21ſt. The firſt ligature, with the ſtick, came away with eaſe.

Auguſt 22d. The ſecond ligature came away with equal eaſe.

An account of the ſtate of the pulſe at the wriſt, and of the temperature of both limbs, at the ham, and at the foot, was taken every day with great accuracy by Mr. G. Babington, according to the annexed Table *, until Auguſt the 27th, when the temperature of each was found to be equal.

The ſize of the tumor gradually decreaſed, and the patient, having the perfect uſe of his limb, was diſmiſſed, cured, October 10, 1794.

The preceding caſe differs materially from the two former, not only in the circumſtance of the tumor in this having been ſituated in the

* See page 119.

upper part of the thigh, ſo that the artery could not be ſecured lower than about an inch below where the profunda is uſually given off, but likewiſe in the very great pain the patient endured both night and day for three weeks before the operation. The tumor was as conſiderable, but the enlargement of the limb below it was much leſs than in the former caſes. After the operation, the ſymptoms were much ſlighter than in the other caſes, probably owing to the low ſtate I thought it proper to reduce the patient to for the purpoſe; and the ligature came away on the tenth day after the operation without the leaſt trouble. But the circumſtance in which it differed the moſt eſſentially from the other two, was, that the tumor was completely abſorbed in ſeven weeks, and the patient had then acquired a perfect uſe of the limb, while, in the former caſes, the patients did indeed acquire the uſe of their limbs, but the tumors, though leſſened and free from pulſation, ſtill remained.

TABLE.

TABLE.

Day of the Month.	pulse at wrist	tem. of arm.	tem. right ham.	right foot.	left ham.	left foot.	Time of day when the obs. were made.
Auguſt 11		68½°	98°	94 °	97 °	96 °	10½ P. M.
12		68½	97	91	91	89	8½ A. M.
	128	70	99	91	94	93	10½ P. M.
13	109	68	98	92	90	88	8½ A. M.
	112	71	100	95	98	95	10½ P. M.
14	104	68	98	91	91	91½	8½ A. M.
	116	72	99	96	96	96	8¼ P. M.
15	96	69	97	91	94	88	8¼ A. M.
	112	72½	97	93	94	95	8 P. M.
16	97	72	98	93½	94	90	8 A. M.
	112	73	98	95	94	94	8 P. M.
17	96	71	98	92	95	89	8 A. M.
	112	74	97	94	94	94	8 P. M.
18	92	70	93	91	92½	89	8 A. M.
	110	72	97	92	94	93	9 P. M.
19	100	68	94	90	91	91	8 A. M.
	124	71½	101	96½	97	97	8½ P. M.
20	114	67	100	93	96	94	8½ A. M.
	116	70	99	95	95	94	8½ P. M.
21	Firſt ligature and ſtick came away with eaſe, there being a perfect ſolution of continuity.						
	100	66 °	97°	8°	93 °	86 °	8 A. M.
	100	69	98	92	95	94	8 P. M.
22	Second ligature was removed.						
	100	69°	96°	86 °	93 °	84 °	8½ A. M.
	108	69	98	94	97	95	9 P. M.
23	100	67½	96	91	93	90	9 A. M.
	104	70½	98	94	95	93	8½ P. M.
24	96	69	97	89	95	87	10 A. M.
	104	69	99	95	98	95	8 P. M.
25	104	66½	98	93	96	92	8½ A. M.
	106	69½	95	92	93	91	8 P. M.
26	100	64	96	90	91	86	8 A. M.
	106	66	98	92	94	90	8½ P. M.
27	100	64	96	91	92	91	8½ A. M.
	95	63½	96	90	96	90	8 P. M.

VIII. *An Account of a Key Inſtrument of a new Conſtruction; with Obſervations on the Principles on which it acts, in the Extraction of Teeth, and on the Mode of applying it. By Mr.* Robert Clarke, *Surgeon at Sunderland, in the County of Durham. Communicated in a Letter to Mr.* Anthony Carliſle, *Surgeon of the Weſtminſter Hoſpital, and Reader of Anatomy in London; and by him to Dr.* Simmons.

To Mr. CARLISLE.

SIR,

WITH this I ſend you a Key Inſtrument, for the Extraction of Teeth, of a conſtruction different from any in common uſe, and which in practice fully anſwers to the expectations I had formed, *a priori*, from a careful examination of the principles of its action.

I cannot, perhaps, give you a clearer idea of its advantages, than that which you will obtain by purſuing the ſame train of inveſtigation which I followed myſelf. I ſhall therefore proceed to lay it before you, that I may more thoroughly convince you of the propriety of the alteration I have made, or be corrected by your pointing out any error I may have fallen into.

In

Fig. VI

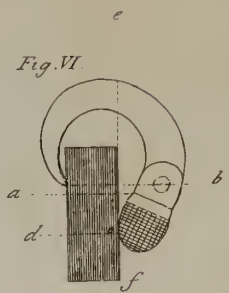


Fig. I

Key Instrument of the old Construction

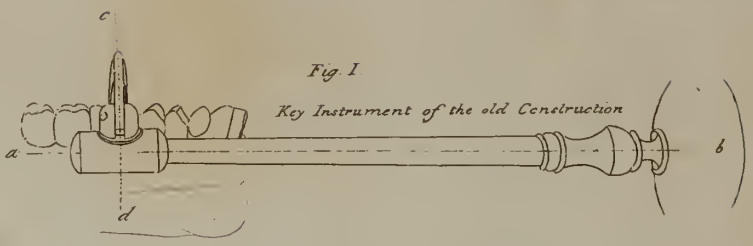


Fig. VII.

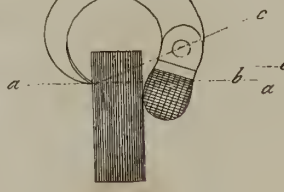


Fig. II

Key Instr. of the Common Construction

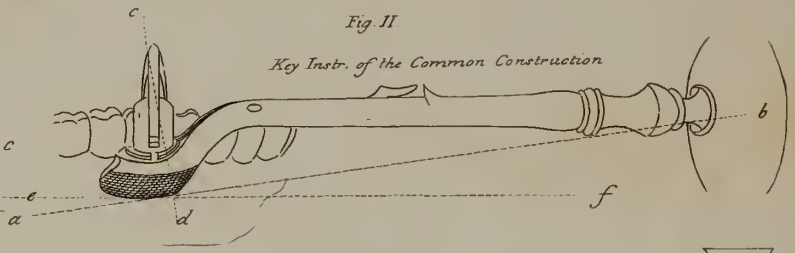


Fig. VIII

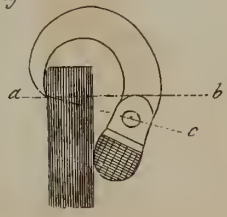


Fig. III

Key. Instr. of the improved Construction

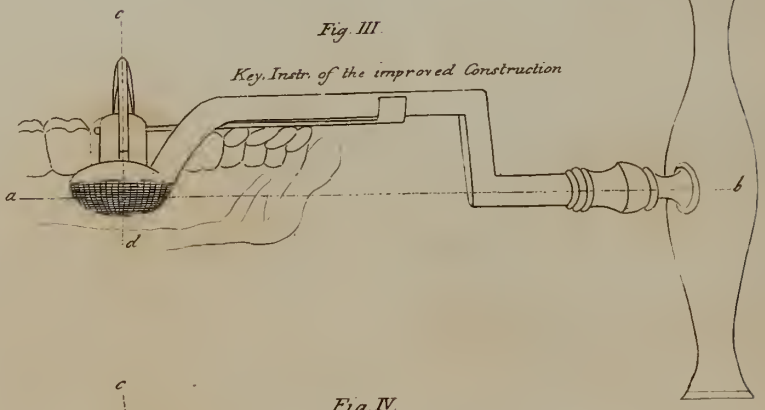


Fig. IX.

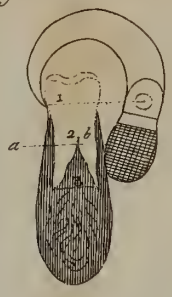


Fig. IV.

Key. Instr. of the Common Construction fixed on the inside of the Jaw

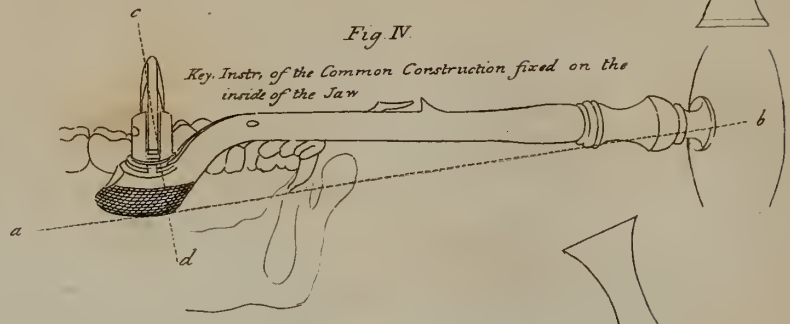


Fig. X

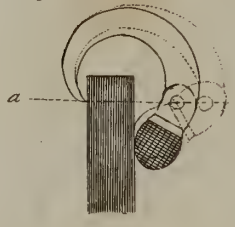
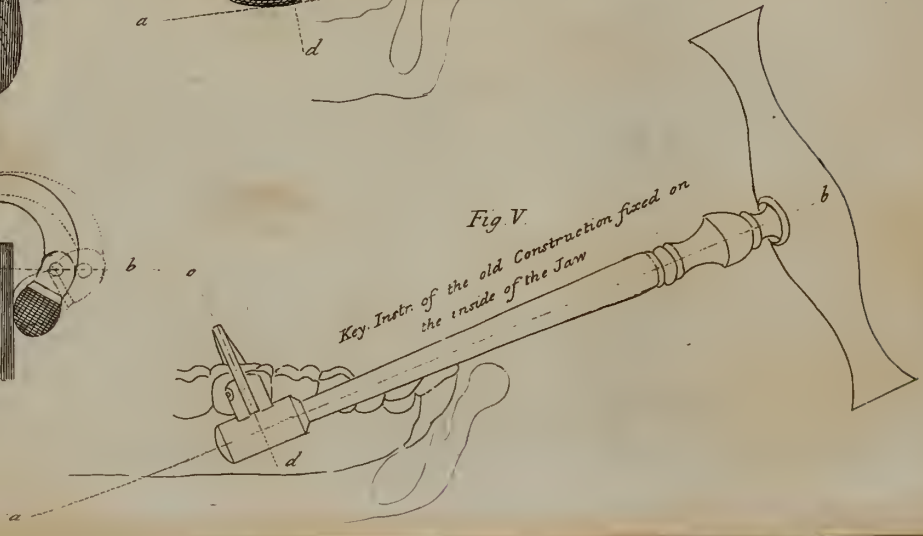


Fig. V.

Key. Instr. of the old Construction fixed on the inside of the Jaw



In the firſt place then, it appeared to me that as the fulcrum, or point, upon which the tooth is carried round as on a center, is that part of the bolſter which reſts upon the gums, the axis of motion of the inſtrument would always be found by drawing a line through that point and the middle of the handle; and conſequently that the old conſtruction of the Key Inſtrument was free from an inconvenience which attends the more modern one: I mean the axis of the bolſter and axis of the ſhank making an angle with each other; on which account it is diſpoſed to ſhift its point of action on the gums, and to raiſe the tooth in a plane inclined to the throat, inſtead of a vertical one, as may be clearly ſeen by inſpecting Figures I. II. (Plate II.*) where *a*, *b*, repreſent the axis of motion; *c*, *d*, the direction in which each inſtrument raiſes the tooth; and *e*. *f*. (Fig. II.) the axis of the bolſter.

Now as the line of direction in Fig. I. is perpendicular to the jaw, it is needleſs to ſay that it is highly preferable to Fig. II. where the line of direction is inclined backward, making the

* It ſeems right to obſerve here, that all the figures of this plate are on a reduced ſcale of two thirds of their proper ſize.

extraction

extraction of the tooth more difficult, and expoſing that which is ſituated behind it to be driven from its ſocket, or even to be caught in the arch of the claw. Beſides this, the bolſter reſts only upon the corner *d*, adding greatly to the injury of the gums.

The conſtruction then of the Key-inſtrument delineated in Fig. I. would ſeem perfect, were it not that in drawing teeth inwards, with reſpect to the jaw, the fore teeth prevent its due application, confining it to the direction repreſented in Figure V.

To remedy this imperfection I have made the inſtrument with a bend in its ſhank, to clear the fore teeth, and to allow its proper application, as in Figure III. where the ſame obſervations and references apply as in Figure I. and therefore it is unneceſſary to repeat them. But in order that the comparative merits of the three inſtruments may be ſeen at a glance, I have added Figures IV. and V. wherein the axis of motion, and the direction of the riſing tooth, are ſhown by dotted lines.

Having fully conſidered what relates to the direction of the tooth, I ſhall next examine the mechaniſm which takes hold of it. For this purpoſe recourſe muſt be had to the engraving.

Let

Let *a*, *b*, *c*, Figure VI. repreſent an end view of a Key inſtrument, fixed upon a piece of hard, ſmooth wood. Then it is obvious, that if it be turned from left to right, by means of its handle, it will break the wood in the direction *d*, *c*, and cauſe the upper fragment to revolve on the point *c*, as a center. It is equally obvious, that if a line be drawn from the point *a*, croſſing the oppoſite ſurface of the ſolid *e*, *f*, at right angles, the counterpoiſe of the claw will fall into that line before it can take hold; for then the point *b*, is at the greateſt poſſible diſtance from the ſurface *e*, *f*; conſequently if the inſtrument be placed as in Figure VII. the point *c* will deſcend; or, if as in Figure VIII. it will aſcend until it coincides with the line *a*, *b*.

I ſhall now endeavour to apply this to practice. Let 1, 2, 3, in Figure IX. repreſent a tooth with its roots fixed in a ſection of the jaw, and its corona engaged in a Key-inſtrument; then it will readily appear that upon the action of the inſtrument, the tooth will be drawn from its ſocket, and carried round the point *b*, as a center, rather than the joint ſubſtance of the tooth and jaw be broken in the line *a*, *b*, as happens in Figure VI. This however happens

only under particular circumſtances : For if the bolſter be placed too high, the tooth will be broken ; and if too low, the alveolar proceſs will always be torn away with it. It is therefore a matter of importance to determine the beſt point of contact for the bolſter, and this I have uniformly found to be at two-thirds the depth of the tooth, the claw being fixed at one third, as repreſented in Figure IX.

It will always be eaſy to aſcertain this point, by attending to the ſize of the corona, and the part of the jaw where the tooth is ſituated ; and equally ſo to make the inſtrument act upon it, by uſing a larger or ſmaller claw as the caſe may require. For illuſtration, however, I ſhall refer to Figure X. which repreſents a piece of wood graſped by the tooth inſtrument in the ſame manner as in Figure VI. Now if a larger claw, ſhewn by the dotted line, be uſed, the bolſter will fix higher upon the wood than before. For as the center pin of the claw will always reſt in the line *a*, *b*, the bolſter muſt riſe higher before it can come into contact. But notwithſtanding the uſe of a larger or ſmaller claw, in proportion to the ſize of the tooth, enables us to fix it at a proper height, the uſe of a very diſproportionate one is always inconvenient,

inconvenient, by depriving us of the uſe of the crank, in drawing teeth inwards, and by encroaching upon the cheeks in drawing them outwards. I have therefore in the conſtruction of this inſtrument, taken care to make the bolſter of ſuch a depth, as to be free from either inconvenience.

The form of the bolſter is by no means a matter of indifference; for if it be too ſmall, it preſents ſo ſmall a ſurface to the gums, that the preſſure made upon them, by the extraction of a tooth moderately firm, cuts them through, and even penetrates the bone, eſpecially if the bolſter be of the uſual form. I have therefore been careful to make it of a proper ſize, and to give it a prolate ſpheroidal figure, as being the leaſt diſpoſed to injure the gums, and applicable with exactneſs and eaſe to all parts of the mouth; and in order ſtill further to guard againſt this bruiſing of the gums, I wrap the bolſter to the thickneſs of a line, with tow, wound on as tight as I can, before I ſlide forward the bolt and put in the claw.

I have alſo been attentive to the form of the claws, that they may touch the tooth only with their points. And the inſtrument is ſo contrived, that they can be quickly changed or turned

turned to an oppoſite direction as the caſe may require: this is done by means of a ſliding bolt, inſtead of a ſcrew, which paſſes through the claws.

I have always found that when the tooth is to be turned from right to left in drawing it, that the handle anſwers beſt placed perpendicularly; and when from left to right, horizontally. The reaſon of this will be obvious, if we conſider that in the firſt caſe, the pronator muſcles of the operator's arm, which are thoſe exerting the force, act with moſt advantage when the hand is vertical; and in the ſecond caſe, that the ſupinators act moſt advantageouſly with the hand prone. I have therefore contrived the handle ſo that it may be eaſily turned, as often as there is occaſion to turn the claw.

I am, Sir, &c.

Sunderland, Aug. 18, 1794.

ROBERT CLARKE.

IX. *An*

IX. *An Account of a new Species of Swietenia (Mahogany); and of Experiments and Obſervations on its Bark, made with a View to aſcertain its Powers, and to compare them with thoſe of Peruvian Bark, for which it is propoſed as a Subſtitute: Being an Abſtract of a Paper on this Subject, addreſſed to the Honourable Court of Directors of the United Eaſt-India Company. By* William Roxburgh, *M. D.*

THE ſpecies of Swietenia deſcribed in this paper, and which Dr. Roxburgh names *Swietenia Febrifuga* *, is a native of the mountainous part of the Rajamundry Circar, North of Samulcotah and Peddapore. It is a very large

* Dr. Andrew Duncan, junior, who has made this new ſpecies of Swietenia the ſubject of a very ingenious inaugural Diſſertation, gives a good reaſon for preferring, as a trivial name, the Hindoo appellation, *Soymida*, to one founded on its medicinal properties; ſimilar properties, he obſerves, being aſcribed by Dr. Wright (London Medical Journal, Vol. VIII. p, 286) to the mahogany tree of Jamaica *(Swietenia Mahagoni)*, another ſpecies of the ſame genus.—Vide *Tentamen inaugurale de Swietenia Soymida*; *Auctore* Andrea Duncan. 8vo. Edinburgi, 1794. EDITOR.

large tree, known among the Hindoos by the name of *Soymida*, and flowers about the end of the cold or beginning of the hot ſeaſon. Its ſeeds ripen in three or four months after.

Of this tree Dr. Roxburgh gives the following botanic deſcription:

" TRUNK. Very ſtraight, riſing to a great " height, of a great thickneſs, and covered " with a grey, ſcabrous, cracked bark.

" BRANCHES. Numerous, the lower " ſpreading, the higher aſcending, forming a " very large ſhady head.

" LEAVES. Alternate, about the extre- " mities of the brachlets *(turiones)* abruptly " feathered, about twelve inches long.

" LEAFLETS. Oppoſite, very ſhort, pe- " tiolated, three or four pair, oval, obtuſe, or " end-nicked, the lower ſide generally extend- " ing a little further down on the petiolet than " the upper; ſmooth, ſhining; from three to " five inches long, and from two to three " broad, the inferior ſmalleſt.

" PETIOLE. Round, ſmooth, about nine " to ten inches long.

" STIPULES none.

" PANICLE. Very large, terminal, dif-

fuſe,

" fuſe, bearing great numbers of middle-ſized,
" white, inodorous flowers.

" PEDUNCLE and PEDICLES. Round
" and ſmooth.

" BRACTS. Very minute.

" CALYX. Below, five-leaved; LEAF-
" LETS. Oval, deciduous.

" COROL. Petals five, inverſe, egged,
" obtuſe, concave, expanding. NECTARY.
" Not quite half the length of the petals, a
" little bellied; mouth ten-toothed, teeth bi-
" fid (two-cleft).

" STAMEN. Filaments ten, very ſhort,
" inſerted juſt within the mouth of the nectary.
" ANTHERS. Oval.

" PISTIL. Germ conical. STYLE. Thick,
" tapering. STIGMA. Large, targetted, ſhut-
" ting up the mouth of the nectary.

" PERICARP. Capſule egged, large, five-
" celled, five-valved, valvelets gaping from
" the top.

" RECEPTACLE. In the centre, large,
" ſpongy, five-angled; angles ſharp and con-
" nected, with the ſutures of the capſule, be-
" tween them, deeply ſulcated.

" SEEDS. Many in each cell, imbricated,
" obliquely wedge-ſhaped, enlarged by a long

" membranaceous wing, inſerted, at the upper " point of the wing, into a long brown ſpeck " on the upper part of the excavations of the " receptacle: all the reſt of the receptacle is " white."

The wood of this tree, we are told, is of a dull red colour, remarkably hard and heavy; and is reckoned, by the natives, by far the moſt durable timber they know; on which account it is uſed for all the wood work in their temples.

The bark of the trunk and large branches, of large and middle-ſized trees, is covered with a dark ruſty-coloured coat, of about an eighth of an inch in thickneſs, which cracks in various directions, and ſometimes peels off in irregular pieces, according to the directions of the cracks. Immediately under this is a very firm, but brittle coat, of about three-eighths of an inch in thickneſs. When firſt cut, it is light-coloured; but on drying, or even expoſure to the air for a few minutes, it turns to a reddiſh brown. The inner lamina are thin, conſiſting of tough, lighter-coloured layers.

The bark of the younger branches is not cracked, is pretty ſmooth, of a much lighter colour,

colour, and has not the ruſty coat above deſcribed, but has often many blotches of various coloured lichen over it: it conſiſts wholly of the brown, ſolid, and inner layers.

The outer ruſt-coloured layer of the trunk has but little taſte; the other two poſſeſs a little aromatic ſmell, and their taſte is very bitter and aſtringent, accompanied with ſomething aromatic, but in a trifling degree. There is nothing diſagreeable in the taſte, more than may be expected from a pure, ſimple, ſtrong bitter and aſtringent united. The middle lamina are eaſily reduced to a very fine roſe or light brown-coloured powder.

Cold water, in the courſe of an hour, our author obſerves, acquired from this bark a deep but clear reddiſh colour. The moſt minute portion of a chalybeate (one drop of a ſolution of twenty grains of ſal martis in an ounce of water) inſtantly changed a much-diluted cold infuſion to a deep purple, which, on ſtanding, became darker and darker, with a reddiſh tinge; and no decompoſition took place till about the tenth day; the colouring matter then began to ſeparate, and fall to the bottom in black flakes, leaving the liquor almoſt colourleſs. If the infuſion was ſome days (from four to thirty)

old, the colour produced by the martial ſolution was as inſtantaneous as when freſh, and deeper; and at no period, up to thirty days, did it ſhow the leaſt tinge of green. Ten times the ſame quantity of the ſame martial ſolution, it ſeems, did not produce ſo great a change upon a ſimilar infuſion of the common pale Peruvian bark; and its effect on the latter was much ſlower. Its bitter qualities are alſo deſcribed as much more intenſe than thoſe of the common ſort of Peruvian bark.

The infuſion, we are told, bears to be mixed in any proportion with ſpirits, without becoming turbid, or producing any kind of decompoſition. The firſt decoction is conſiderably deeper-coloured than the infuſion (which colour it retains in paſſing the filter), and poſſeſſes the ſame powers in a higher degree, but does not retain them ſo long, nor is it ſo pleaſant to the taſte. On ſtanding any length of time with the chalybeate, the colour becomes pale, and is ſooner decompoſed than the cold infuſion: on ſtanding ſome days it lets fall a ſmall quantity of a reddiſh, earthy fecula, which is intenſely bitter and aſtringent; the ſuperincumbent liquor becoming gradually clearer and clearer, and at the ſame time of a deeper red, much reſembling the tincture. Lime-water added to the decoction,

infuſion,

infuſion, or diluted tincture, darkened them conſiderably, and cauſed in all a copious depoſition of reddiſh brown fecula, which became purple coloured in twenty four hours. The decoction, it is obſerved, gave the greateſt quantity of fecula. An infuſion of pale Peruvian bark, prepared in every reſpect the ſame as the infuſion of Swietenia bark, was treated with lime-water in the ſame manner, and formed a ſeparation, but in a much leſs degree.

Bark of *Melia Azadirachta* (Margoſa tree) treated exactly in the ſame manner, formed a ſeparation of a lighter-coloured fecula, in a much greater quantity than the common Peruvian bark, but much leſs than the Swietenia bark.

The clear reddiſh-coloured liquor, we are told, that floats over the precipitate cauſed by the addition of lime water, is void of aſtringency to the taſte, or has it only in a trifling degree; but for a farther proof, it ſeems, a chalybeate was employed, which did not in the leaſt darken this liquor; but a greeniſh tinge was produced, together with a further decompoſition and precipitation of a reddiſh fecula. This experiment, our author thinks, ſerves to ſhow that at leaſt the aſtringent part of the bark is entirely thrown down by lime-water; and he conſidered this as ſo intereſt-

ing a point, that he repeated the ſame experiment with this, as well as with other aſtringent barks, and found the reſult exactly the ſame.

The ſame chalybeate added to lime-water of the ſame ſtrength as that employed in the above-mentioned experiments, produced a ſmall, green cloud; the Swietenia bark infuſion thrown into this produced a muddineſs, and ſoon after, a copious precipitation of dirty-coloured fecula.

An infuſion of this bark in lime water is deeper coloured than the plain infuſion, but poſſeſſes very little bitterneſs, and ſtill leſs aſtringency. A chalybeate added to this infuſion rendered its red colour a little deeper only, and no decompoſition took place: after ſtanding ſome time, the infuſion had no taſte of the lime-water.

From theſe experiments, Dr. Roxburgh conſiders lime-water as a very improper addition; and obſerves that, in this reſpect, they agree with thoſe made by Dr. Irving on the red and quilled Peruvian barks.

Vitriolic acid rendered the firſt decoction, or watery infuſion, paler; and, upon ſtanding, it became a little turbid, and let fall a ſmall quantity of a light-brown ſediment.

Vinegar had the ſame effect.

Mild, or cauſtic vegetable alkali, or mild foſſil

foſſil alkali, ſoon deepened and rendered brighter the cold watery infuſion or decoction, nor did any decompoſition take place in forty-eight hours.

Mild magneſia, ſimply added, rendered the colour of the infuſion paler, without ſenſibly altering the taſte.

Alum has been at times ſucceſsfully employed for the cure of intermitting fevers, and the analogy it bears to other tonics renders it a likely remedy. Our author was therefore deſirous to try what would take place on adding it in a ſmall quantity to infuſions and decoctions of this bark. The addition, it ſeems, rendered their colour paler, and a little decompoſition took place, with a precipitation of a ſmall quantity of a light-brown fecula: to the taſte it increaſed the aſtringency without ſenſibly diminiſhing the bitter; but with alum they did not change their colour when a ſolution of green vitriol was added.

Eight ounces of the coarſe powder were boiled in ten pints of ſoft well water to four pints; the reſiduum was repeatedly boiled in freſh parcels of water, exactly in the ſame manner for eleven times, when the liquor

came off ſtill much coloured, but taſteleſs, and ſhowed no ſigns of aſtringency with the chalybeate; the tenth decoction excepted, which did ſhow ſigns of aſtringency, as it was darkened a little by it.

The freſh decoction of common Peruvian bark, made ſimilarly, but in a ſmaller quantity, ſtruck ſlowly about as deep a colour with the ſame chalybeate, as the fourth or fifth decoction of Swietenia bark did quickly.

As the eleventh decoction was taſteleſs, although coloured, it was thrown away; the other ten had been regularly ſtrained, while hot, and ſuffered to ſtand till perfectly cold, then poured off, clear from ſediment; they were mixed, and evaporated to a hard extract, which weighed two ounces and three-quarters. The extract, when ſoft, was of a dark red colour, flavourleſs, ſmooth, homogeneous, and unctuous when rubbed between the fingers and thumb. The taſte of the decoction was well preſerved in this extract; the moſt minute part of it, diſſolved in water, ſtruck a black colour with martial ſolution as quickly and as deep as the decoction itſelf, but the taſte was not ſo ſtrong as might be expected from that of the bark. This, our author thinks, might

might perhaps be owing to the more fixed, inert parts, extracted by the long and repeated boilings (which lasted two days) being mixed in the mass of extract. But this, he observes, would not be the case, or but in a small degree, with one prepared from only one or two boilings. To determine this point, he boiled one ounce of the powdered bark in two pints of water, pretty briskly, down to one pint; after the liquor was poured off, to the residuum were added two other pints of water, and boiled in the same manner. The decoctions were mixed, and evaporated to a dry extract, which weighed two drachms and a half, and was in taste, &c. much as the former from ten coctions; the proportion of extract from two boilings is therefore, he observes, nearly equal to that of ten: so that, although the decoctions were highly coloured, and considerably bitter and astringent, even to the tenth, yet they could have contained but a small portion of the powerful qualities of the bark.

The residuum, when perfectly dry, weighed four drachms and a half; and spirit of wine being poured on it, though assisted at times with the heat of the sun for many days, extracted neither

neither colour nor taſte, ſo completely had the virtues of the bark been extracted by the water.

Dr. Roxburgh obſerves that the dry extract imbibes much moiſture when the weather is damp; ſo much as to make it ſtain the fingers, or any thing that touches it: that it melts readily in the mouth; is eaſily ſoluble in water and in ſpirits; and, like the decoction and tincture, bears to be mixed without decompoſition. Theſe ſolutions and mixtures, we are told, reſemble much the original decoction and tincture, and their mixtures, both in taſte and colour.

Should this ever become the valuable drug it promiſes, it would be adviſable, our author thinks, to have the extract prepared on or near the ſpot where the trees grow. If this is done during the hot ſeaſon, the evaporation, he obſerves, might be effected by the heat of the ſun and hot winds, which would certainly produce a much more elegant, efficacious extract than could poſſibly be prepared in any other way or place, and would alſo preclude every idea or chance of its being ſophiſticated.

This bark, he finds, contains much mucilaginous matter, the cloth that the decoctions were

were ſtrained through, having become, when dry, ſtiff as if ſtarched. This, he thinks, may account for the decoctions remaining ſo many days turbid, which is, no doubt, he adds, favourable for the action of the ſtomach upon the bark. The late Dr. Fothergill, he obſerves, recommended an addition of ſome mucilage to decoctions of common bark, in order to keep them turbid, that the active parts might be kept more completely ſuſpended in the liquor *.

In the way of diſtillation, this bark, it ſeems, yields nothing, not the ſmalleſt apparent quality, either with water or ſpirits. In this reſpect, Dr. Roxburgh thinks, it reſembles exactly both the pale and red Peruvian barks, viz. in having its powers or virtues of a very fixed nature.

Rectified ſpirit of wine extracts from the bark a clear, deep red tincture, poſſeſſing the aſtringency of the watery infuſion or decoction, and more of the bitter. If not too ſtrong, it makes, we are told, one of the moſt pleaſant bitters we are in poſſeſſion of; and it bears to be diluted with water in any proportion, without decom-

* Med. Obſ. and Inq. Vol. I. p. 321. 2d Edit. 8vo. London, 1758.

poſition,

poſition, which renders it in many caſes the more deſirable.

Four ounces of powdered bark were infuſed, by our author, for eight days, in three pints of French brandy; theſe were poured off, and four pints more of the ſame brandy added, which, after ſtanding four days, were alſo poured off: both theſe infuſions were mixed, and he drew off, by diſtillation, a quantity of the ſpirit, which (as before obſerved) did not in the leaſt partake of any of the qualities of the bark: the reſt was gently evaporated to a dry extract, which weighed nine drachms. The extract itſelf was of a much darker colour than that procured by water, and was dried with more difficulty; but the taſte of the two extracts was much the ſame. The reſiduum was boiled in ſix pints of water to two, and the decoction was found to be ſtill pretty ſtrong to the taſte, both in bitterneſs and aſtringency. This induced him to repeat the boiling, twice more, with freſh parcels of water; and the laſt decoction, though weak, was ſtill bitter, and ſhowed ſigns of aſtringency, with a martial ſolution. Theſe four decoctions were mixed and evaporated to a dry extract, weighing three drachms, which added to the ſpirituous extract,

tract, made in all twelve drachms, from four ounces of powdered bark, and agreed nearly with the quantity procured by water alone.

The antiseptic powers of this bark, according to our author's experiments, are not inferior to its bitter and astringent qualities; for watery infusions in open phials kept perfectly good for sixty days, without any tendency to fermentation, except a few air bubbles, which they discharged about the second day; indeed they acquired strength, we are told, as the colour produced at the end of that time (sixty days), by the addition of a chalybeate, was darker, and as instantaneous as at any prior period.

Sixty grains of the lean of raw mutton were preserved sweeter and firmer in an infusion of ten grains of this bark in four ounces of water, than an equal quantity of the same mutton in a similar infusion of pale quilled Peruvian bark. The flesh was tinged red by the infusion of Swietenia bark, and its fibres were firm and distinct at the end of twelve days; while that preserved in the Peruvian infusion was white, and its fibres softer, and infinitely more fetid.

Almost all the foregoing experiments, it is observed,

obſerved, were made firſt with bark of the ſmaller branches, and again with bark of the trunk of a large tree; the latter was evidently ſtrongeſt.

The ſeeds of this tree are deſcribed as a ſtrong, ſimple, pleaſant bitter, without any of the aſtringent power. The leaves poſſeſs nearly if not all the aſtringency of the bark, and a very large proportion of its bitter; but their taſte is ſaid to be not ſo agreeable either in ſubſtance or in infuſion.

From the foregoing analyſis, Dr. Roxburgh ventures to draw the following concluſions:

Firſt. That the active parts of the bark of this ſpecies of Swietenia are much more ſoluble than thoſe of Peruvian bark, particularly in watery menſtruums.

Secondly. That it contains a much larger proportion of active (bitter and aſtringent) powers, than Peruvian bark.

Thirdly. That the watery preparations of this bark remain good much longer than ſimilar preparations of Peruvian bark.

Fourthly. That the ſpirituous and watery preparations bear being mixed in any proportion, without decompoſition.

Fifthly. That the bark in powder, and its preparations,

preparations, are much more antiſeptic than Peruvian bark, or ſimilar preparations of it.

Now, ſince this bark yields ſo much of its virtues to cold water, as to preſerve fleſh from corruption, in a hot climate, with the thermometer from 87° to 102°, it is reaſonable, he contends, to ſuppoſe it will yield ſtill more of its tonic and antiſeptic virtues in the ſtomach, where it meets with the moſt powerful ſolvents: we have therefore, he thinks, much to expect from it in the cure of gangrene and other putrid diſeaſes.

Bitters and aſtringents, in a ſeparate ſtate, our author obſerves, are conſidered as tonic remedies; but when found combined in the ſame ſubſtance, they become ſtill more powerful: it is from theſe qualities, he contends, that the beſt judges allow the Peruvian bark to derive its virtues. On this point he quotes the authority of Dr. Cullen, who has remarked, "that the "recurrence of the paroxyſms, in intermitting "and remitting fevers, depends on the recur- "rence of atony in the extremities of the arterial "ſyſtem; hence they are prevented by ſuch "tonic medicines as obviate this atony: a "great variety of aſtringents and ſimple bitters "have been found to anſwer that end, but "none, hitherto diſcovered, ſo effectually as the "Peruvian

" Peruvian bark, on account, it is thought, of " its poſſeſſing thoſe powers conjoined *."

The antiſeptic qualities of Peruvian bark, our author obſerves, are alſo great; hence its uſe in the cure of all febrile putreſcent diſorders, attended with debility, putrid ulcers, &c.

From the evident qualities of this new bark, and from the ſucceſsful experience he has had with it, in intermittent fevers †, &c. Dr. Roxburgh

* Treatiſe on the Materia Medica.

† Hiſtories of ſeveral of theſe caſes have been communicated by Dr. Roxburgh to the College of Phyſicians at Edinburgh, and an account of them is given by Dr. Duncan in the diſſertation referred to in a former note, together with the reſults of ſeveral trials made with this bark, by his father, in the Clinical Ward of the Royal Infirmary at Edinburgh. We ſhall take the liberty of tranſcribing this part of his work:

" Morbus, quo Roxburgius hunc corticem ſæpiſſimè adhi-
" bendum curavit, febris quotidiana apud Cullenum nun-
" cupatur. Rariùs ex toto, ſed ex parte, et ad breve tantum-
" modo tempus, remittens, periculoſiſſimus erat. Ægroti ferè
" omnes hoc morbo correpti fuerant, dum incolebant iſtos
" montes ingentes, qui Indiæ peninſulam tranſcurrunt. Inter
" hos montes ſylvæ opacæ, denſa ferarum tecta, convalles pa-
" ludoſas, hominum generi peſtiferas, ubique obumbrant. Se-
" des eſt indigenis etiam, conſuetudine licet obſirmatis, inſa-
" lubris, advenis autem adeo pernicioſa ut pauci, perpauci
" quidem, quos dira neceſſitas inter hos montes hiemare coege-
" rit, morbo hoc atrociſſimo immunes ſint. Tali febre, tali
" tempeſtate

burgh has every reaſon to imagine it will prove equal, if not ſuperior, to the Peruvian bark, for every purpoſe for which that medicine is uſed.

Our

" tempeſtate laborantium ne dimidiam quidem partem con-
" valeſcere Roxburgius affimat.

" Cal. Junii, A. D. 1791. Indus annos natus viginti,
" habitûs tenuis, nonnullis antè menſibus, dum prope montes
" occupabatur, febre quotidianâ affectus erat. Corticem
" Cinchonæ officinalis aliquantiſper ſine fructu aſſumpſerat;
" idcirco Roxburgius, et quia ipſe parvas corticis Soymidæ
" quantitates impunè adhibuerat, ægro nihil à periculo ab-
" horrenti grana viginti pulveris ex aquæ cyatho ſumenda
" præſcripſit. Duabus exinde horis, ſcrupuli duo adhibiti
" ſunt; et, poſt ſimile temporis intervallum, drachma. Cor-
" tex ægro nequaquam ingratus erat, alvumque ſolvit. Æger,
" cortice poſtea ad drachmam, unaquâque intermiſſione, aſ-
" ſumpto, triduo febre immunis erat.

" Pridie Iduûm Auguſti, A. D. 1791, J— V— Luſi-
" tanus*, annum agens quadrageſinum quintum, ejuſque duæ
" filiæ, altera ſex, altera tres annos nata, manſerant aliquan-
" diu, inter menſem proximè præteritum, intra montium ter-
" minos; initioque menſis labentis, febre quotidianâ, quæ
" nihil fermè quicquam remiſit, affecti ſunt. Febre remit-
" tente, ſemper alterâ quaque horâ ſumebant aquæ ex cortice
" Soymidæ* pater ſeſcunciam, filia major natu unciam, et
" minor ſemunciam. Duos poſt dies, à morbo valebant.

* " *R.* pulv. cort. Swiet. Soymidæ unciam unam,"
" aquæ fontanæ libras duas.
" Miſceantur, et phialâ priùs agitatâ, modo præſcripto ſumantur."

* Vide p. 148.

Our author next enumerates different ſpecies of Cinchona, viz.

Firſt.

" Morbus, quo hi quatuor ægroti laborabant, partim ob " anni tempus, quo febre correpti ſunt, atque partim ob " tempeſtatis ſiccitatem, ſolito levior erat; atque Roxbur- " gius, propter ægrorum debilitatem, neque evacuantia ad- " hibebat, nec intermiſſiones expectabat.

" xv. Cal. Sept. A. D. 1791, B— Luſitana, habitûs " infirmi, nonnullos dies, febre gravi, nunquam ex toto re- " mittente, laboraverat. Antimonium tartariſatum ex multâ " aquâ, partitis vicibus, uſque ad vomitionem, adhibuit. " Poſtero die drachma corticis Soymidæ, in remiſſione mi- " nimè adhuc notabili, ter aſſumpta eſt. Intermiſſio proxima " plenior evaſit, atque, ex corticis uſu, biduo poſtea morbus " ipſe, ſimulque diarrhœa quâ laboraverat ægra, ceſſârunt.

" Menſe Septembris, A. D. 1791, J. E— decurio Euro- " pæus, annos natus quadraginta, febre remittente graviter " affectus eſt. Receſſus principio ferè nulli, ex uſu præpara- " torum ex antimonio notabiliores evaſerunt; et æger, quan- " quam omni generi intemperantiæ deditus, cortice ter ſin- " gulis intermiſſionibus adhibito, paucis diebus convaluit.

" vii. Cal. Sept. A. D. 1791, T. L— annos natus " octodecim, quoſdam dies febre bilioſâ laboraverat; cujus " receſſus, etiam poſt antimonii tartariſati uſum, parum " notabiles erant. Debilitate autem urgente, ſcrupuli duo " corticis Soymidæ, omni receſſu, ter adhibebantur, et, ad " alvum ſolvendam, lixiva tartariſata.

" A cortice autem nihil proficiente, iii. Cal. deceſſum " eſt; atque medicamentis idoneis aſſumptis, febris prorſûs " fere,

First. *Cinchona Officinalis panicula brachiata*; to this ſpecies, he obſerves, belong the pale, quilled,

" fere, ſtatis temporibus, intermiſit. Soymida nunc iterum " adhibita, quatuordecim diebus, morbum penitùs fugavit.

" Menſe Septembris, A. D. 1791. S— nutrix lactans, " annos nata triginta quinque, febre quotidianâ correpta " eſt. Alvo, inter primam intermiſſionem, ſodâ vitriolatâ " ſolutâ, morbus triduo cortice Soymidæ depulſus eſt; ſed " lac interim fluere ceſſaverat.

" Menſe Septembris, A. D. 1791. Indus, ſervus domeſ- " ticus †, febre ſingulariter intermittente ægrotavit. Sub " occaſum ſolis, acceſſit febris gravis, quæ horâ nonâ veſ- " pertinâ intermiſit. Oriente autem ſole, iterum acceſſit, " atque, horam circiter nonam ante meridiem, denuo inter- " mittens, ægrum viribus integrum reliquit. Exinde cor- " tice Soymidæ ter, ſingulis intermiſſionibus matutinis, ad " ſcrupulos duos adhibito, triduo morbus omnino evanuit.

" J— R— Europæus annum agens trigeſimum, vitio pul- " monis multum debilitatus, ineunte Octobri febre quotidi- " anâ, cui erant acceſſiones veſpertinæ, affectus eſt. Tertiâ " intermiſſione, duo corticis ſcrupuli bis adhibiti alvum " magnopere ſolverunt. Soymidâ nihilominus continuatâ, " æger quatuor diebus à febre valebat.

" Pridie Iduûm Decemb. R— miles Indicus, annos natus " triginta, febre quotidianâ tredecim dies, medicamentis " vernaculis nihil proficientibus, laboraverat. Intermiſſione " proximâ duo corticis Soymidæ ſcrupuli ex aquâ ter adhi- " biti alvum bis cierunt, morbumque levarunt. Cortex " repetitus ægro ſanitatem reſtituit.

" Pridie Iduûm, Dec. A. D. 1791, L— miles Indicus,

† Vide p. 148.

quilled, and red barks, which the beſt judges imagine are from the ſame tree; the thick-red

" annos natus viginti tres, antecedente die, febre quotidianâ " affectus eſt. Cortice ter ſingulis intermiſſionibus adhibito, " alvus ſoluta eſt, morbuſque mox remiſit.

" Pridie Iduûm Dec. S. N— miles Indicus, annos natus " quadraginta, IV. Non. Decemb. febre correptus erat. Nullis " hactenus medicamentis uſus, magis nunc magiſque debilis " evaſerat. Cortex in remiſſione ter adhibitus ventrem " ſolvit, triduoque morbum depulſit.

" Pridie Iduûm Dec. A. D. 1791. N— miles Indicus, " annum agens vigeſimum quintum, pridie febre quotidianâ " affectus erat. Cortex Soymidæ, ter in unaquaque inter- " miſſione adhibitus, alvum movit, atque morbum brevì ſu- " peravit.

" VIII. Cal. Martii, A. D. 1792. J. V— per biduum " febre iterum * laboraverat. Morbo autem duo acceſſus " totidemque remiſſiones quotidie erant, ejus inſtar paulò " ſuprà deſcriptæ †. Cortex Soymidæ, in matutinis inter- " miſſionibus, alterâ quaque horâ adhibitus, triduo febrem " curavit.

" Circiter medium Februarii, R— infector telæ xylinæ, " annos natus viginti quinque, laborans tumore hypogaſtrii " æquali, dolente, quem comitata eſt febris omni mane rece- " dens, atque alvus aſtricta, ad Roxburgium adductus eſt; " cui dixit, ſe duodecim antè dies affectum eſſe dolore circa " umbilicum torquente, qui uno alterove die gravis evaſit, " atque profundus, et, quaſi inter veſicæ urinariæ fundum " atque inteſtinum rectum, ſedem cepit; abdomen mox tu- " muiſſe, ipſumque toto corpore febricitâſſe; cauſam autem

* Vide p. 145. † Vide p. 147.

" ignorâſſe

red sort being from the trunk, while the pale-quilled sort is from the branches, and from young

" ignorâsse malorum; multa denique remedia vernacula
" incassùm adhibuisse.

" Ei præcepit medicus, ut assumeret parvas lixiviæ tar-
" tarisatæ quantitates, donec superveniret catharsis, pro
" potu communi biberet aquam ex tamarindis coctam cum
" saccharo, et ut interea diætâ ex oryzâ famem tolleret.

" Alvo his exoneratâ, meliuscule se habere sensit æger;
" tumori autem nequaquam decrescenti, vesicatorium ad-
" motum est, alvusque lixivâ tartarisatâ et aquâ ex tama-
" rindis cum saccharo commistâ soluta est.

" Per noctem febris invaluit. Die autem, à curatione
" inceptâ, tertio alvus vehementer fluxit. Dejectiones
" purulentæ admodum erant, pessimè olentes, colore per-
" virides. Tumor statim subsedit.

" Æger maximè debilitatus, per noctem, graviter fe-
" bricitabat. Mane igitur, cùm primùm febris se remisis-
" set, ei pulvis ex Soymidæ cortice et lixivâ tartarisatâ com-
" positus adhibitus est, et, die progrediente, ter repetitus.
" His factis, alvus purulenta quædam quater dejecit. Hâc
" curatione triduo pòst à febre valebat, et, cortice nunc
" semel tantum in die adhibito, decem diebus domum re-
" dist sanus.

" Roxburgius unam tantum occasionem corticis Soymidæ
" contra gangrænam adhibendi nactus est. Viro dissoluto,
" per idem tempus lue Venereâ laboranti, super mediam
" tibiam ulcus erat. Cùm Soymidæ pulvis eius stomacho
" nigratus esset, extracto usus est, atque, expectatione ci-
" tiùs, morbo immunis evasit. Perhibet præterea Roxbur-

young trees. The Spaniards themſelves, he adds, employ the red ſort.

Second.

" gius, Duffinum chirurgum valetudinarii Madraſienſis pri-
" marium hunc corticem contra iſtiuſmodi mala maximo
" cum fructu adhibuiſſe.

" His memoratis, Roxburgius ingenuè fatetur inſignem
" tempeſtatis ſiccitatem, hujus novæ Swieteniæ corticis
" uſum feliciorem forſitan reddidiſſe. Notat præterea, cor-
" ticem primo die alvum plerumque moviſſe, poſtea autem
" nunquam, neque profectò, præter morbi curationem,
" ullos ex ejus uſu effectus obſervâſſe. Cur, ante corticis
" uſum, non ſæpiùs, ut mos pleriſque eſt, vomitum et al-
" vum moviſſet, hanc rationem reddit, nempè ex regionis
" naturâ, ex victu, ex vitâ, atque ex religione, corpora
" Indis eſſe gracilia, nec plena, ne inflammationibus ob-
" noxia; atque remediis, quæ ante corticem adhiberi ſo-
" lent, febres, ut ille putat, in longum ſæpe trahi, et iis,
" æque ac morbo fere ipſo, ægrotos infirmari.

" Hæc uberiùs dixi atque fuſiùs eò quòd ex his potiſſi-
" mum, quantum polleat hic cortex, apparet. His adduc-
" tus pater meus, cùm ægrotos noſocomio Edinburgenſi
" curabat, atque diſcentibus de iis prælegebat, nova hujus
" corticis tentamina facere voluit. Hâc autem regione,
" cùm febris intermittens perrara ſit, nobis nulla, quid pro-
" ficiat cortex noſter, experiendi idonea ſatis occaſio oblata
" eſt. Nonnullis autem ægrotis adhibita eſt.

" XIII. Cal. Jan. A. D. 1793. Joannes M'Kay, annum
" agens vigeſimum tertium, priuſquam in noſocomio recep-
" tus erat, duodecim dies febre, cujus acceſſiones altero
" quoque die redibant, laboraverat. Sed, cùm, ab initio

" horror

Second. *Cinchona Caribæa*; the Caribæan or

" horror et calor per idem tempus duraviſſent, ſudor pror-
" sùs defeciſſet, atque mala pectoris, coma, et torpor fe-
" brem comitata eſſent, hæc affectio minimè idonea, in quam
" novum medicamen tentaretur, videbatur. Cortex igitur
" Cinchonæ rubræ, per duodecim dies adhibitus eſt; cùm
" autem acceſſus poſt intervalla, licet valde diſſimilia, ad-
" huc redirent, ægro, ut Soymidæ drachmam alterâ qua-
" que horâ ſumeret, præſcriptum eſt. Alvum torminibus
" magnopere movit, acceſſus autem proximus poſtremus
" erat. Convaluit.

" Jacobus Grant, annos natus viginti quinque, qui ali-
" quandiu in noſocomio propter teſtis tumorem manſerat,
" VIII Iduûm Junii, A. D. 1793, herbâ humidâ veſperi
" recumbens, frigore, gravi dyſpnœa atque anguſtiæ in
" faucibus ſenſu, affectus eſt. Hæc facile ætheri vitriolico
" ceſſerunt, cortexque Cinchonæ, quo vires proſtratas re-
" ficeret, adhibitus eſt. v. Iduûm iterum frigore, dyſpnœâ,
" atque vomitione ſanguinolentâ, correptus eſt. Quinto
" poſtea veſpere horrores, intermittentis inſtar, acceſſerunt.
" Uſum corticis Cinchonæ, quippe qui acceſſionibus nihil
" obſtaret, intermiſit medicus, pulveremque corticis Soy-
" midæ, duplici autem quantitate, in ejus locum adhibuit.
" Hoc facto morbus nunquam poſtea rediit.

" Duabus adoleſcentulis, alteri à ſingulari affectione hyſ-
" tericâ, convaleſcentibus cortex Swieteniæ Soymidæ, ut
" corpora firmaret, ſi non cum utilitate ſaltem ſine incom-
" modo, adhibitus eſt.

" Vi inſuper aſtrictoriâ pollere, ſatis conſtat è muliere
" annorum quadraginta ſex, quæ leucorrhœâ laborabat.

or Jamaica bark of Dr. Wright *. This laſt, our author obſerves, poſſeſſes in a higher degree the bitter, but is very weak in the aſtringent power, and ought not to be depended on when the other is procurable.

Third. *Cinchona Sanctæ Luciæ, floribus paniculatis, glabris, laciniis linearibus tubo longioribus, ſtaminibus exertis, foliis ellipticis glabris*; Saint Lucia, or new bark. This is another ſort, which has been introduced into practice: but its being poſſeſſed of ſtrong emetic and purgative qualities, renders it, in our author's opinion, leſs eligible, particularly after the paſſages have been cleared. Theſe properties, he obſerves, the Jamaica bark does not poſſeſs; which eſtabliſhes a ſtriking difference.

Fourth. *Cinchona Corymbifera, foliis oblon-*

"Ducbus ſenibus ventris fluxu affectis nihil profecit. Hi "autem, omnia, quæ alvum aſtringunt, experti, morbo "non levato, è noſocomio egreſſi ſunt.

"Cortex Soymidæ, ut multum, necne, contra putredi- "nem poſſet, appareret, quinque ægrotis typho putrido "laborantibus adhibitus eſt. Omnes convaluere. His "ventrem adeo non movit, ut, per totum morbum, alvum "aliis medicamentis ducere opus eſſet." *Vide* Duncan *Tentam. de Swietenia Soymida*, p. 41. et ſeq.—EDITOR.

* See Philoſ. Tranſact. Vol. LXVII. page 504; and London Medical Journal, Vol. VIII. page 239.

gis,

gis, lanceolatis, corymbis axillaribus; of Dr. Forſter; is a native of the South-Sea Iſlands: but of its virtues we know nothing more, than that he ſays, " it is like Peruvian bark, bitter " and aſtringent."

Fifth. *Cinchona Orixenſis, foliis oppoſitis, tomentoſis, ſtipulis interfoliaceis, ſemilanceolatis, floribus terminalibus, paniculatis, tomentoſis, capſula valvis contrariis à vertice dehiſcens*; of Dr. Roxburgh. The ſtructure of the capſule, he obſerves, forms the chief difference between this and Cinchona Officinalis, for the ſeeds are exactly as delineated by Gærtner, and the reſt of the definition correſponds with that given by Linnæus. It is a native of that chain of mountains which ſeparates the northern provinces, or circars, from the Mahrattah dominions immediately behind them. The bark of this ſpecies likewiſe is bitter and aſtringent.

Dr. Roxburgh has alſo found another new ſpecies of Swietenia, a middle-ſized tree, the wood of which is very heavy, cloſe-grained, and yellow; the bark likewiſe is yellow, and very bitter, but poſſeſſes much leſs aſtringency than that of the S. febrifuga, and its aſtringengy, he obſerves, is of a peculiar kind, for the colour produced, on an infuſion, with a martial ſolution, was a dark brown.

There

There is alſo the bark of another large tree, which, at the time of writing this account, he tells us, he had under examination, and which is likewiſe very bitter: the Hindoos call it *Wallurſe*. It will, he imagines, form a new genus in the claſs Decandria, and order Monogynia. Its eſſential characters are *calyx quinquefidus, petala quinque, nectarium duplex, exterius cylindricum oré decemfido, antheras gerens, interius annularium, baſin germinis cingens, bacca monoſperma.*

The bark of this tree, we are told, is in high repute as a medicine amongſt the Hindoo phyſicians; and gives name to a compound ſoft extract, called *Walluvoduſay*, which they employ in a variety of diſeaſes.

It alſo poſſeſſes powers of a very different nature; for, powdered and thrown into pools where there are fiſh, it ſoon intoxicates them to that degree, that they are eaſily taken with the hand.

Dr. Roxburgh obſerves that the bark of *Melia Azadirachta*, already taken notice of*, has frequently and ſucceſsfully been employed as a ſubſtitute for Peruvian bark, in the cure

* Page 133.

of remittents and intermittents; and that an infuſion or decoction of its leaves is alſo a good anthelmintic, and as ſuch employed by the Hindoos.

The bark of another large tree, which our author calls *Nauclea Daduga*, poſſeſſes alſo, he tells us, in a conſiderable degree, both the bitterneſs and aſtringency of Peruvian bark; and he thinks it is next in power to that of the Swietenia febrifuga. Although this tree differs widely in its flower from the hitherto known ſpecies of Cinchona, yet in its parts of fructification it agrees with them, it ſeems, almoſt exactly.

X. *An Account of the Effects of Mahogany Wood in Cases of Diarrhœa. By Mr.* Francis Hughes, *Surgeon of the General Infirmary at Stafford. Communicated in a Letter to Mr.* John Pearson, *Surgeon of the Lock Hospital, and by him to Dr.* Simmons.

AN accidental circumstance first suggested to me the idea that mahogany wood might prove serviceable as a medicine; for I did not then know that any part of the tree had been employed for medicinal purposes. I was accordingly induced to make use of it in cases of diarrhœa, both in decoction and in the form of an extract; and after repeated trials, I can venture to assert that I have not been disappointed in the expectations I had formed of its efficacy.

For the decoction I boil an ounce of the shavings of Jamaica mahogany wood in two pints of water, till one pint of the liquor is wasted, and then strain off the remainder for use.

The extract I make use of has been prepared by

by boiling the ſhavings of the ſame wood in repeated affuſions of freſh water, in the ſame proportion and manner as are directed for the extract of logwood *(extractum hæmatoxyli)* of the London Pharmacopœia. The quantity of extract obtained in this way amounts to ſomething more than $\frac{1}{8}$ of the ſhavings employed. The Honduras mahogany wood is of a paler colour, and leſs aſtringent than the Jamaica, and does not yield quite $\frac{1}{10}$ part of extract.

Both the decoction and extract are very bitter and aſtringent, leaving a roughneſs in the mouth for ſome time after they have been taſted.

The extract, in its appearance, reſembles gum kino. It diſſolves completely in water, and in ſpirit of wine, and ſtrikes a black colour with ſalt of ſteel.

The following are ſome of the Caſes in which I have employed theſe remedies.

CASE I.

In July, 1793, a ſoldier belonging to a regiment on the Iriſh eſtabliſhment, who is a native of Stafford, was ſent hither from his regiment

giment for the recovery of his health. He had for ſome time been unfit for duty, and was much reduced by a diarrhœa, which having come on after a fever, had continued ſeveral months, and reſiſted a variety of medicines.

I gave him an ounce of the decoction three times a day, and as it ſat eaſy on his ſtomach, and ſeemed to have a good effect, the doſe, after the third day, was increaſed to an ounce and a half. He perſevered in the uſe of it during ſixteen days; the diarrhœa gradually ſubſided; his appetite and ſtrength returned; and at the end of that time he was ſufficiently recovered to go back to his regiment in Ireland.

CASE II.

A woman of a thin, delicate habit, applied to me in October, 1793, on account of a violent diarrhœa, for which ſhe had taken different medicines without any good effect. It had come on, ſhe ſaid, after ſitting up a whole night in wet clothes, and had continued more than a fortnight; ſhe was free from fever.

I directed her to take pills compoſed of ſix grains

grains of the extract, three times a day. Within the ſpace of a week the diarrhœa was much abated, and ſhe had acquired ſtrength; ſhe perſevered, however, in the uſe of the medicine for the ſpace of three weeks, at the end of which time the complaint had entirely ceaſed. A fluor albus, with which ſhe had been troubled many months, was likewiſe much abated; but perhaps this latter circumſtance ought rather to be aſcribed to the improved ſtate of her general health, than to any ſpecific effect of the medicine.

CASE III.

In January, 1794, I was applied to by a man fifty years old, who for ſeveral years had been a hard drinker, and was now extremely emaciated; his legs were oedematous; he had no appetite; was ſubject to frequent vomiting, and had a ſlight diarrhœa.

I gave him aromatic bitters for ſeveral days, but finding no amendment, I determined to have recourſe to the mahogany. I gave him eight grains of the extract, made into pills, three times a day. At the end of five days his diſpoſition

diſpoſition to vomit had ceaſed, and he had a little appetite. He continued the uſe of the medicine for ten days longer, and was then ſo much relieved as to be able to walk and ride out every day. This ſtate of amendment continued for a fortnight, when he relapſed into his old habit of drinking, and his former ſymptoms returned. Recourſe was again had to the ſame medicine, but without effect.

To the above I could add many other inſtances of the good effects of the extract and decoction in caſes of long continued diarrhœa, where the complaint ſeemed to depend on a morbid irritability of the ſtomach and inteſtines, and where the uſe of tonic and aſtringent medicines appeared to be indicated. The few hiſtories I have related will, I truſt, be ſufficient to point out the modes of adminiſtering the remedies in queſtion, and the effects that may be expected from them; and perhaps will induce medical practitioners to extend a trial of their efficacy to other diſeaſes.

The doſes in which I have hitherto given theſe remedies have been ſmall; but much larger doſes may be given with ſafety, and in many caſes will, I am perſuaded, be more efficacious.

To

To try the effect of a considerable dose on the stomach, I took two ounces of a decoction, prepared by boiling two ounces of the shavings in two pints of water to a pint, which is twice the strength of the decoction described in Case I. and which I have usually administered. At first I perceived no effect from it; but at the end of ten minutes a disagreeable nausea came on, with a slight pain at the stomach, and a glowing sensation similar to that produced by the taking a glass of strong wine. These effects gradually went off in about half an hour, and I felt no other inconvenience from the dose.

Stafford, Feb. 12, 1794.

XI. *Account of ſome Diſcoveries made by Mr.* Galvani, *of Bologna; with Experiments and Obſervations on them. In two Letters* from Mr.* Alexander Volta, *F. R. S. Profeſſor of Natural Philoſophy in the Univerſity of Pavia, to Mr.* Tiberius Cavallo, *F. R. S.—From the Philoſophical Tranſactions of the Royal Society of London, for the Year* 1793. Part I. 4to. London, 1793.

THE ſubject of the diſcoveries and researches, concerning which I am about to write to you, Sir, is *animal electricity*; a ſubject which cannot but be extremely intereſting to you. I know not if you have yet ſeen the work of a Profeſſor of Bologna, Mr. Galvani, which appeared about a year ſince, with this title; ALOYSII GALVANI *de Viribus Electricitatis in Motu Muſculari Commentarius.* Bononiæ, 1791, in 58 pages, 4to, with four large plates; or at leaſt if you have had any

* In the Philoſophical Tranſactions theſe two letters are given in French; for the preſent tranſlation of them we are indebted to the kindneſs of a friend.—EDITOR.

account

account of it*. It contains one of the moſt beautiful and ſurpriſing diſcoveries, and the germe of ſeveral others. Extracts from this work have appeared in different Italian Journals, and, among others, in that entitled *Gionale Fiſico-medico*, publiſhed by Dr. Brugnatelli, of Pavia, to whom I myſelf have ſent two long papers, which will be followed by ſeveral others, as I have conſiderably extended my experiments and inquiries on this ſubject. The letters I now addreſs to you are intended as a ſketch both of the admirable diſcovery of Mr. Galvani, and of the progreſs which I have been fortunate enough to make in this new path; and I requeſt you, Sir, to preſent them to Sir Joſeph Banks, Bart. the worthy Preſident of the Royal Society, to be communicated, if he thinks proper, to that learned body, as a feeble teſtimony of my gratitude for the honour they have done me in electing me one of their number, and of my zeal and eagerneſs to comply with their invitation to communicate to them, from time to time, the fruit of my reſearches.

(1.) Mr. Galvani having diſſected and prepared a frog, in ſuch a manner that the legs remained attached to a part of the back bone,

* See Vol. III. p. 180.—Editor.

ſeparated from the reſt of the body, ſolely by the crural nerves, which were laid bare, obſerved that very lively motions were excited in theſe legs, with ſpaſmodic contractions in all the muſcles, every time that (this part of the animal being placed at a conſiderable diſtance from the conductor of an electrical machine, and under certain circumſtances, which I ſhall explain hereafter) a ſpark was drawn from this conductor, not on the body of the animal, but on any other body, or in any other direction. The requiſite circumſtances, therefore, were, that the animal thus diſſected ſhould be in contact with, or very near ſome metal or other good conductor, of ſufficient extent, or, what was ſtill better, between two ſimilar conductors, one of which ſhould be turned towards the extremities of the legs of the animal, or ſome one of its muſcles; the other towards the ſpine, or its nerves: it was likewiſe very advantageous that one of theſe conductors, which the author diſtinguiſhes by the names of *conductor of the nerves*, and *conductor of the muſcles*, and preferably the latter, ſhould have a free communication with the floor. It was in this ſituation eſpecially, that the legs of the frog, prepared as above deſcribed, received violent ſhocks,

ſhocks, ſprang up and contracted with vivacity at each ſpark drawn from the conductor of the machine, although it was at a conſiderable diſtance, and although the diſcharge was made neither on the conductor of the nerves, nor on that of the muſcles, but on any other body, equally remote from them, and having any other communication through which the diſcharge might be tranſmitted, for inſtance, on a perſon placed in the oppoſite corner of the room.

(2.) This phenomenon ſurprized Mr. Galvani, perhaps more than it ought to have done; for the power, not only of electric ſparks when they immediately ſtrike the muſcles or nerves of an animal, but of a current of this fluid traverſing them, in any manner whatever, with ſufficient rapidity, its great power, I ſay, of exciting commotions, was a thing ſufficiently known; beſides, it was obvious how, in this experiment, and in all thoſe of the ſame kind, related in the firſt and ſecond parts of his work, and which are repreſented in the two firſt plates of figures, his frog became liable to be affected by ſuch a current. We have only to conſider that well-known property of electrical atmoſpheres, or what is called *compreſſive electricity*, by which the fluid of conducting bodies,

placed within the ſphere of action of an electrified body, is compreſſed and diſplaced, in proportion to the force and extent of this ſphere, and kept in this ſtate of diſplacement ſo long as the electricity ſubſiſts in the predominant body; and when this is removed, returns to its place gradually, if the electricity of that body is ſlowly diſſipated, or in an inſtant if it be deſtroyed inſtantaneouſly, by diſcharging ſuddenly the body that contained it. It is this returning current, therefore, this reflux of electrical fluid in the conducting bodies contiguous to the frog, or near it, its ſudden paſſage from the conductor of the muſcles to the conductor of the nerves, or *vice verſa*, through its body, eſpecially when ſuch a current is compreſſed in the ſingle and narrow channel of the nerves, which excites the ſpaſms and movements in the experiments in queſtion. Mr. Galvani, who ſeems not to have ſufficiently reflected on this property of electrical atmoſpheres, and who was not aware of the prodigious ſenſibility of his frog, ſingularly prepared in the manner above deſcribed (I muſt here obſerve that I have found this ſenſibility nearly equal in all the other ſmall animals, ſuch as lizards, ſalamanders, and mice) was extremely ſtruck with ſuch an effect, which will probably

probably not appear ſo marvellous to other philoſophers. This, however, was the firſt ſtep which led him to the grand and beautiful diſcovery of an animal electricity, properly ſo called, and which belongs not only to frogs and other animals of cold blood, but likewiſe to every animal of warm blood, quadrupeds, birds, &c.; a diſcovery which forms the ſubject of the third part of his book, a ſubject altogether new, and very intereſting. It is thus he has opened to us an immenſe field, into which I propoſe to enter, and purſue my reſearches, after I ſhall have dwelt a little more on thoſe preliminary experiments which relate to the action of artificial or extraneous electricity on the nervous and muſcular fibres.

(3.) It was chance that preſented to Mr. Galvani the phenomenon I have been deſcribing, and which aſtoniſhed him (I repeat it) more than it ought to have done. Still who would have believed that a ſtream of electricity, ſo feeble as not to be rendered ſenſible by the moſt delicate electrometer, ſhould be capable of affecting ſo powerfully the organs of an animal, and of exciting in its limbs, cut off one or more hours before, movements, nowiſe inferior in ſtrength to thoſe produced in the living animal,

animal, ſuch as vigorouſly darting out its legs, ſpringing up, &c. to ſay nothing of the moſt violent tonic convulſions? And yet ſuch is the ſtream that affects the little animal, placed, for inſtance, on a table, near ſome metal, or between two good conductors, not inſulated, when a perſon draws from the prime conductor, ſuſpended ſeveral feet above, a moderate ſpark, and conveys the diſcharge through quite another channel.

(4.) I ſay *moderate*; for if it be very ſtrong, and the conductor, large and highly charged, be not at a very conſiderable diſtance from the bodies on the table, little ſparks will be perceptible in the interſtices of theſe bodies, eſpecially the metallic ones, and even in the place where the frog forms a ring of communication between them, which ſparks are evidently produced by the returning ſtream of electricity, of which I have already ſpoken, (ſect. 2.) Or if matters do not come to this point, inſtead of ſparks we may perceive movements, ſufficiently obvious, of electrometers placed on the ſame table and in the ſame places. In this caſe, therefore, where the electrometer affords the ſign, and much more in the other, where the above-mentioned ſparks are obtained, we may obſerve, that

that even a frog, entire and untouched, or any other ſmall animal, as a lizard, a mouſe, or a ſparrow, is ſeized with ſtrong convulſions in all its limbs, eſpecially in its legs, which dart forwards with vivacity, if the paſſage of the electric fluid (the returning ſtream) follows the direction of theſe ſame legs from one end to the other. So far there is nothing wonderful; the circumſtance that may excite ſurpriſe is in the caſe where the ſtream of electricity, though no longer ſenſible, not even to the moſt delicate electrometer, continues to excite the ſame convulſions, the ſame movements, if not in the entire frog, at leaſt in its limbs, when diſſected and prepared in the manner practiſed by Mr. Galvani.

(5.) I have endeavoured, with much attention, to determine what might be the leaſt electrical power requiſite to produce theſe effects, as well in the entire and living frog, as in one diſſected and prepared in the manner above deſcribed, which is what Mr. Galvani has omitted to do. I have preferred the frog to every other animal, becauſe it is endowed with a very durable vitality, and it is very eaſy to prepare it. I have, however, made experiments on other ſmall animals with the ſame view, and with a ſucceſs nearly ſimilar. In order to eſtimate well

the

the ſtrength of the ſtream of electricity, I have thought it right to ſubmit the animal intended for experiments of this kind, not to the returning ſtreams occaſioned by electrical atmoſpheres (Sect. 2.), but to direct electrical diſcharges, ſometimes from a ſimple conductor, ſometimes from a Leyden phial, and in ſuch a manner that the whole ſtream muſt have paſſed through the body of the animal. For this purpoſe I was careful to keep it inſulated in one way or other, and moſt frequently by fixing it, with pins, to two flat pieces of ſoft wood, ſupported by glaſs columns.

(6.) I have found then, that for the living and entire frog the electricity of a ſimple conductor, of a middling ſize, is ſufficient, when it comes only to be able to give a very weak ſpark, and to raiſe Henley's electrometer from five to ſix degrees; that if I make uſe of a Leyden phial, likewiſe of a middling ſize, a much weaker charge of this produces the effect, ſuch a one, for example, as yielding not the leaſt ſpark, and being nowiſe ſenſible to the quadrant-electrometer, is ſcarcely ſufficiently ſo to Cavallo's electrometer to ſeparate its little pendula about 1-tenth of an inch.

(7.) This, as I have juſt now ſhown, for a

frog entire and untouched; for when it is diſſected and prepared in different ways, and particularly after Galvani's manner, in which the legs are connected with the dorſal ſpine merely by the crural nerves, a much weaker degree of electricity, whether from the conductor or from the Leyden phial (the fluid being obliged to paſs through the narrow paſſage of the nerves), fails not to excite convulſions, &c. Yes, an electricity forty or fifty times weaker, as a charge of the phial that is abſolutely imperceptible to the laſt-mentioned electrometer (Cavallo's), and even to that extremely delicate one of Bennet; a charge, that I was able to render ſenſible only by means of my condenſer, and which I think may be eſtimated at five or ſix hundredths of a degree of Cavallo's electrometer.

(8.) Thus then, in the legs of a frog attached to the ſpine of the back ſolely by its nerves (theſe being laid bare), we have a new ſpecies of electrometer; ſince electrical charges, which from their yielding no ſign to the electrometers already in uſe, would ſeem null, afford ſuch obvious ones to this *animal electrometer*, if I may be allowed the expreſſion.

(9.) When

(9.) When we have ſeen how, in a frog thus prepared, ſtrong convulſions are excited by an extremely weak electricity, by an imperceptible ſtream of fluid, we ought ſurely to be no longer ſurpriſed, that the animal ſhould be affected in the ſame manner when any body whatever diſcharges ſuddenly the prime conductor of an electrical machine, and occaſions another ſtream of electric fluid, great or ſmall, of the fluid before diſplaced in the conducting bodies near the frog, and which reeſtabliſhes itſelf, in the manner already explained (Sect. 2.), to paſs rapidly through its nerves. Let us ſuppoſe this returning ſtream to be ſcarcely equal to that which a conductor, ſufficiently bulky, throws off directly, with an electricity that yields no ſpark, and that is almoſt inſenſible even to Cavallo's electrometer, or a ſmall Leyden phial, charged ſcarcely a tenth of a degree of this ſame electrometer; let us ſuppoſe, I ſay, that the ſtream of electricity is not ſtronger than this, ſtill it will be ſufficient, as my experiments, above related (Sect. 6. and 7.), ſhow, to excite the movements in queſtion.

(10.) But if, after the experiments juſt now referred

referred to, we ought no longer to be ſurpriſed at thoſe of Mr. Galvani, deſcribed in the firſt and ſecond parts of his work, how can we avoid being ſo at thoſe entirely new and wonderful ones related in the third? Experiments in which he obtained the ſame convulſions and violent movements of the limbs, without having recourſe to any artificial electricity, or extraneous excitement, by the ſimple application of a conductor, one end of which was made to touch the muſcles, and the other the nerves or ſpine of the frog prepared in the manner already deſcribed. This conductor, he found, might be either entirely metallic, or compoſed partly of metal and partly of other bodies of the claſs of conductors, as water, one or more perſons, &c. Even wood, the walls and floor of the room, might enter into the circle provided they were not too dry; it was only by the interpoſition of non-conducting ſubſtances, as glaſs, roſin, and ſilk, that the effect was prevented. Bad conductors, however, did not do ſo well, and only during the firſt moments after the animal was prepared, and ſo long as the vital powers remained in full vigour; after which good conductors only were found to ſucceed,

ceed, and in a ſhort time it was found impoſſible to produce the effect unleſs with excellent conductors, that is, with conductors entirely metallic. He moreover found a great advantage from applying a ſort of metallic armour, or coating, to that portion of the ſpine which he left attached to the crural nerves, and to the nerves themſelves, and particularly from covering this part with a thin leaf of tin or lead.

(11.) Mr. Galvani did not confine himſelf, in theſe truly aſtoniſhing experiments, to frogs; he extended his trials with ſucceſs, not only to ſeveral other animals of cold blood, but likewiſe to quadrupeds and birds; in all of which he obtained the ſame reſults, by means of the ſame preparations, which conſiſted in laying bare ſome principal nerve at the part where it paſſes into a limb ſuſceptible of motion, and after arming the nerve with ſome metallic ſubſtance, forming a communication, by means of his conductor, between this coating and the muſcles to which the nerve is diſtributed.

(12.) It was thus he fortunately diſcovered, and demonſtrated to us, in the moſt evident manner, the exiſtence of a real *animal electricity* in all, or almoſt all animals. It ſeems in fact to be proved by his experiments, that the electric fluid

fluid tends inceſſantly to paſs from one part to another of a living organized body, and even of detached limbs, ſo long as any remains of vitality ſubſiſt in them; that it tends to paſs from the nerves to the muſcles, or *vice verſa*, and that the muſcular movements are owing to a ſimilar transfuſion, more or leſs rapid. In truth, it would ſeem that no objections can be raiſed to this, or to the manner in which Mr. Galvani explains it, by a kind of diſcharge ſimilar to that of the Leyden phial. But a great number of new experiments that I have made on this ſubject, will ſerve to ſhow that many reſtrictions muſt be made with regard both to the thing itſelf, and to the deductions the author has drawn from it; my experiments likewiſe will be found conſiderably to extend the phenomena attributed to this animal electricity, and will diſplay it to us under a great number of new circumſtances and combinations.

(13.) Mr. Galvani, purſuing the idea he has formed to himſelf from his experiments, and adhering in every reſpect to the ſuppoſed analogy of the Leyden phial, and his conductor, imagines there is naturally an exceſs of electric fluid in the nerve, or in the interior part of the muſcle, and a correſponding defect of this fluid

fluid in the outer part, and *vice verſa*; and he ſuppoſes conſequently that one end of this conductor muſt communicate with the nerve, which he conſiders as the conducting wire or hook of the phial; and the other end with the external ſurface of the muſcle. All the figures of his third and fourth plates, and all his explanations relate to this. But if he had a little varied his experiments, as I have done, he would have ſeen that this double contact of nerve and of muſcle, this circuit which he imagines, is not always neceſſary. He would have found, as I have, that the ſame convulſions, the ſame movements may be excited in the legs and other limbs of frogs, and of every other animal, by placing metallic ſubſtances in contact with two parts of a nerve only, or with two muſcles, or even with different parts of a ſingle and ſimple muſcle.

(14.) It is true we are very far from ſucceeding ſo well in this way as in the other, and that in this caſe it is neceſſary to have recourſe to an artifice, of which we ſhall have occaſion to ſpeak more fully hereafter, and which conſiſts in employing two different metals; an artifice, which is not abſolutely neceſſary when the experiment is conducted according to Galvani's method

method above described (Sect. 10 and 11), at least so long as vitality remains in full vigour in the animal, or in its detached limbs; but, at any rate, since by arming the nerves only, or the muscles only, with different metals, we are able to excite contractions in the latter, and movements in the limbs, we must conclude that if there are cases (and this may perhaps still be very doubtful) where the pretended discharge between nerve and muscle (Sect. 12 and 13.) is the cause of the muscular movements, there are likewise many and more frequent circumstances, where the same movements are obtained by quite another play, quite another circulation of the electric fluid.

(15.) Yes, it is quite another play of the electric fluid, of which we may be said rather to disturb than to restore the equilibrium, insomuch as it passes from one part to another of a nerve, a muscle, &c. as well internally by their conducting fibres, as externally by means of the metallic conductors that are applied, not in consequence of any respective excess or defect, but by a peculiar action of these same metals, when they are of different kinds. It is thus I have discovered a new law, which is not so much a law of animal electricity as a law of

common electricity; to which we muſt attribute the moſt part of the phenomena, which, from the experiments of Galvani, and from ſeveral others which I made myſelf, ſeemed to belong to a true ſpontaneous animal electricity, but which in truth do not: they are really the effects of a very feeble artificial electricity, which is excited in a way never before ſuſpected, by the ſimple application of two coatings of different metals, as I have already hinted, and which I ſhall explain better elſewhere.

(16.) I think it right here to ſay, that at the diſcovery of this new law, of this, till now, unknown artificial electricity, I was miſtruſtful of every thing that ſeemed to me to demonſtrate a natural electricity, in the ſtrict ſenſe of the term, and that I was on the point of giving up this idea. But upon carefully reconſidering all the phenomena, and repeating the experiments under this new point of view, I found that ſome of them ſupport ſuch an idea, (thoſe, for inſtance, in which there is no need of different coatings, or even of any coating, a ſimple metallic wire, or any other conducting body, performing the office of conductor between the nerve, and one of the muſcles connected with it, being capable of exciting convulſions in the latter),

latter), (Sect. 10, &c.) and that thus a natural animal and properly organic electricity subsists, and cannot be entirely overturned. The phenomena which establish it, although much more limited, are however sufficient to demonstrate its existence, as I have just now mentioned, and as will more clearly be shown hereafter.

(17.) What will perhaps be found more disagreeable is, that we must likewise confine within narrower limits its influence in the animal œconomy, and give up the finest ideas we had formed of it, and which seemed to be about leading us clearly to explain muscular motion. My experiments, varied in every manner possible, show that the motion of the electric fluid excited in organs, does not act immediately on the muscles; that it does nothing more than excite the nerves, and that the latter, put into action, excite in their turn the muscles. What this action of the nerves is; how it propagates itself from one part of a nerve to another; how it passes to the muscles, and how the motion of the latter results from it; these are problems, in the explanation of which we are not farther advanced than before the discovery in question.

(18.) I come now to the experiments that prove all the assertions I have advanced in these

laſt paragraphs. From a great number I ſhall ſelect only a few, which ſeem to me the beſt calculated to eſtabliſh certain principles, for the moſt part new and different from thoſe adopted by Mr. Galvani. But I muſt firſt ſay a few words more concerning the experiments of this writer. I know not whether he has made others, but thoſe he has deſcribed in his work are included in too narrow a circle; in all of them the object is to lay bare and inſulate the nerves, and to eſtabliſh a communication, by means of conducting bodies, between theſe nerves and the muſcles that are dependent on them (as may be ſeen in all the figures of the four plates annexed to his work), in order to excite convulſions and movements of the muſcles, by the action of the electric fluid. He ſuppoſes therefore, in every caſe, and he explains himſelf pretty clearly on this point, that the transfuſion of the electric fluid that is produced, whether by artificial electricity, or by natural animal electricity, muſt take place from the nerves to the muſcles, or *vice verſa*; that theſe two limits at leaſt muſt be included in order for the muſcular movements to take place; and in truth all the experiments he has deſcribed ſeem to prove this. But then they are confined, as I have juſt now

 ſaid,

ſaid, within a circle that is too limited, and beyond which he has never, or ſcarcely ever, extended his inquiries. By varying the experiments of this kind in different ways, I have ſhown, that neither the one nor the other of thoſe conditions, viz. the laying bare and inſulating the nerves, and the touching ſimultaneouſly theſe and the muſcles, in order to procure the ſuppoſed diſcharge, are abſolutely neceſſary (Sect. 13.). It is ſufficient, when, for inſtance, we have laid bare the iſchiatic nerve of a dog, lamb, &c. if we paſs a ſtream of electricity from one part of this nerve to the other, even though it be near, and leave all the reſt untouched and free; it is ſufficient, I ſay, to do this in order to excite in the limb very ſtrong convulſions and movements; and this whether we employ an extraneous artificial electricity, or excite the electric fluid that is inherent in the nerve itſelf. Here is the manner in which I make theſe experiments.

(19.) Experiment A. I compreſs, with a pair of forceps, the iſchiatic nerve a little above its inſertion into the thigh, and I apply, a few lines higher up, a piece of money, or a plate of metal, on this ſame nerve, carefully ſeparated from the parts that adhere to it, and ſupported

by a thread, a plate of glaſs, a ſtick of ſealing wax, a piece of dry wood, or any other ſubſtance that is a bad conductor. Then placing the belly of a Leyden phial, very weakly charged, on the forceps; I bring the hook into contact with the other piece of metal; and the moment the diſcharge takes place, although it be too feeble to produce the leaſt ſpark, convulſions take place in all the muſcles of the thigh and leg, the whole limb being agitated and ſpringing up with more or leſs violence. And yet the whole of this leg, and even a part of the nerve which paſſes to it, are, as we ſee, out of the track which the electric fluid takes in its paſſage, ſo that only a ſmall portion of the nerve can have been irritated; and yet this is ſufficient to occaſion the convulſion of the muſcles.

(20.) Experiment B. The ſame effects, that is to ſay, ſimilar convulſions and motions of the leg, take place, without our having recourſe to an extraneous electricity, by the diſcharge which takes place, in a certain manner naturally, when we apply, as above, the ſame forceps, or a plate of ſilver, to one part of the nerve, and a plate of ſome other metal, and above all, of tin or lead, to another part, and then bring about a ſimple communication between

tween them, either by an immediate contact, or by the interposition of a third piece of metal made to perform the office of a conductor.

(21.) Thus we see that the same effects, that is, convulsions and violent muscular contractions, take place without any discharge of electric fluid between the nerves and muscles, in the manner Mr. Galvani supposes; and without requiring one end of a conductor to communicate with the one, and the other end with the other. Neither is the other condition, that of laying bare the nerve, and freeing it of its adhesions, at all more necessary, as will appear from the following experiments.

Experiment C. I apply coatings, or plates, of different metals, (and it is this difference of coatings that is essential) (Sect. 14. and 15.) to an entire and living frog, that is covered with its skin, and, in short, is untouched. I apply, for example, a thin piece of tin-foil on its back, or its loins, and I place a piece of silver money under its thighs, or its belly, slightly compressing it; this done, I slide forward the piece of money till it comes into contact with the tinfoil, or I form a communication between the two metals by means of a piece of iron wire, or any other metal; and at that instant convulsive motions

take place in all the muſcles of the belly, thighs, and back, with violent tremors of the legs, contraction and curvature of the ſpine, &c. which convulſions and ſpaſms, although nearly univerſal, are however moſt conſiderable in the limbs and muſcles contiguous to the coatings, and ſtill more ſo in thoſe which are dependent on the principal nerves neareſt to the two metals.

(22.) Theſe experiments ſucceed in ſome other animals; in fiſhes, and particularly in eels, in none of which is it neceſſary to remove the ſkin, though it does not fail, in a ſmall degree, to leſſen the effect. This is why, by removing it, at leaſt in part, particularly in the frog, we obtain the effects with more certainty, and to a greater degree. We likewiſe gain ſomething, in this reſpect, by cutting off the head of the frog, and thruſting a large pin into the ſpinal marrow; we then excite, by means of different coatings in the manner above deſcribed, ſtronger movements, or at leaſt ſuch as are more obvious, becauſe they are no longer confounded with the movements the animal gives itſelf while living.

(23.) If it be advantageous, as we have ſeen, to take off the ſkin of frogs, although very thin and

and pretty moiſt, it is much more ſo, and even neceſſary, to remove it from almoſt all the other animals, as lizards, ſalamanders, ſerpents, tortoiſes, and more eſpecially from quadrupeds and birds, that are furniſhed with a drier and much thicker ſkin, to ſucceed in theſe experiments. The following, therefore, is the mode I adopt.

Experiment D. I faſten to a table, by means of ſome large pins, a lizard, a mouſe, a fowl, &c. and after making an inciſion through the ſkin, and other integuments, to the bare fleſh, on the back of the animal, I turn back the integuments on each ſide; I do the ſame on the thigh or the leg; after which I apply the two metallic coatings on the expoſed parts, viz. on one the tin foil, and on the other a ſpoon or a piece of money; I then form a communication between the two coatings, and every time I do this I excite ſtrong contractions in the adjacent muſcles, and particularly in thoſe of the thigh and leg, which moves and agitates itſelf with great violence. Theſe convulſions are much more conſiderable when the tin foil is applied near the iſchiatic nerve, and the piece of ſilver on the gluteus muſcle, or on that named gaſtrocnemius; and the effects are ſtill greater if the nerve itſelf is laid bare, and coated with the

the tin foil; if, leaving it attached only to the muſcles to which it is diſtributed, we deprive it of every other adherent part; or if, in ſhort, we ſeparate the entire limb from the reſt of the body, with its nerve hanging out, and ſubmit it in this ſtate to our experiments.

I am, &c.

A. VOLTA.

September 13, 1792.

SECOND LETTER.

(24.) It will be ſufficiently underſtood that what I have ſaid with reſpect to the iſchiatic nerve, and the leg, is applicable to the brachial nerve and to the arm, as well as to every other nerve relatively to the muſcles under the influence of that nerve.

(25.) Theſe laſt preparations are analogous to thoſe of Mr. Galvani; and they clearly prove that it is advantageous to lay bare the nerves, and ſtill more ſo, to detach them all round from the adherent parts; but they are far from ſhowing

ing that this is a neceſſary condition, ſince we never fail to obtain the ſame convulſions and movements of the limbs when we ſimply lay bare the muſcles, and leave the nerves covered and concealed under them in their natural ſtate, as all my other experiments above related (Sect. 21, 22, 23.) ſerve to ſhow.

(26.) After theſe trials on reptiles, birds, and ſmall quadrupeds, I proceeded to other and larger animals, as rabbits, dogs, lambs, and bullocks; and I not only ſucceeded in obtaining ſimilar effects in all the ways above deſcribed, but even ſtronger and more durable ones, by reaſon that the vital heat maintained itſelf in thoſe large animals, and in their limbs, a longer time. For I ought not to omit to ſay, that if in the moſt part of animals of cold blood, and particularly in frogs, the vital principle ſubſiſts in detached limbs ſeveral hours, that principle which renders them ſo ſenſible to the weakeſt electrical irritation, it hardly continues beyond a few minutes in animals of warm blood, and commonly diſappears before the whole of this animal heat is diſſipated.

(27.) Having had ſuch ſucceſs with my experiments on large and ſmall animals of every kind, in ſome inſtances alive and entire; in others

others deprived of their ſkin, or their head, or diſſected in different ways ; and having obtained ſimilar effects in their large detached limbs, and almoſt always without the preparation required by Mr. Galvani, that is to ſay, without laying bare the nerves, I was deſirous of going ſtill farther, and of making ſimilar trials on ſmaller limbs, on a ſingle muſcle, and even on ſmall portions of muſcles ; and the freſh ſucceſs I had in theſe trials led me to other diſcoveries, which I will ſoon mention, after having deſcribed ſome of theſe experiments.

(28.) Experiment E. I cut off, in ſome inſtances, the leg and thigh of a frog, in others, the leg only, and in ſome half or a quarter of a leg ; and on applying, as uſual, to one part of the amputated portion the tin foil, and to the other the plate of ſilver, and forming a communication between theſe two coatings, I conſtantly excited convulſions and movements ; I have even ſeparated a ſingle muſcle, for inſtance the gluteus, or the gaſtrocnemius, and ſometimes only a portion of muſcle not larger than a barley-corn, and yet the ſame effects, that is to ſay, very ſtrong contractions of theſe muſcles, or parts of muſcles, have been produced by means of two different coatings, &c.

Expe-

Experiment F. I have repeated the ſame experiments on a leg, on a half or a third part of the leg, on a ſingle muſcle, or part of a muſcle, of a fowl and other birds; on a ſlice of the gluteus of a rabbit, a lamb, &c. and I have had the ſame effects as long as the fleſh preſerved a ſenſible heat. (Sect. 26.)

(29.) Thus then we are able to excite very ſtrong contractions in the muſcles of animals of warm as well as of cold blood, and in every detached portion of muſcular fleſh; and this by means of the ſimple artifice of different metallic armours or coatings, applied to the muſcle itſelf, without any preparation of the nerves, and even without laying them bare. We have beſides ſeen that we can excite theſe effects quite as well, and by the ſame means of metallic coatings applied to two neighbouring parts of the ſame nerve, (Sect. 19, and 20. Experiments A. and B.) whence I have reaſon to conclude, that there is no neceſſity for a diſcharge of electric fluid to take place between nerve and muſcle, or for any tranſmiſſion of it from the interior to the exterior part of the latter by means of the nerve and metallic conductor, as Mr. Galvani ſuppoſes, or *vice verſa:* and that there is no compariſon to be made between

tween the muſcle and the Leyden phial and its diſcharge, in the experiments in queſtion. In fact, what reſemblance or analogy is there to the Leyden phial, where the two plates of metal, a communication between which is formed by the conductor, are applied very near to each other on the external ſurface of the ſame nerve, (Experiments A. and B.) or on the external ſurface of two muſcles, or even of the ſame muſcle (Experiments C. D. E. F.); it muſt be confeſſed it would be in vain to attempt to ſupport any analogy between any of theſe experiments and the Leyden phial.

(30.) Experiment G. Having placed two coatings, one of ſilver leaf, the other of tin foil, on exactly correſponding parts of the two thighs of a frog, I excited contractions of the muſcles, and the uſual motions of the legs, at the inſtant I formed a communication between the two coatings by means of the conductor.

(31.) Is it thus, I aſk, that the diſcharge of two Leyden phials takes place, by forming a communication between their homologous ſurfaces? Let us lay aſide, therefore, theſe ideas of phial and diſcharge, and every forced explanation, and let us ſay ſimply, that in theſe and other analogous experiments, a tranſmiſſion of

the electric fluid takes place from one to another of two parts properly coated; a tranſmiſſion determined, not by a *relative exceſs* of this fluid, which cannot naturally be ſuppoſed between parts that are ſimilar, but by the diverſity of theſe ſame coatings, which muſt be of different metals, as I have taken care already to point out, (Sect. 20, and 21. Experiments B. and C.) and uniformly to inculcate in the ſubſequent parts of my paper.

In fact,

(32.) Experiment H. If two muſcles, or two parts of the ſame muſcle, are ſimilarly coated, that is, with two plates of the ſame metal, both of them equal in temper and hardneſs, in ſoftneſs or rigidity, in the roughneſs or ſmoothneſs of their ſurface, and both are applied in the ſame manner, it will be to no purpoſe to bring about a communication between them by means of a conductor, as no convulſion, no motion will take place.

(33.) I confeſs it is not eaſy to conceive how and why the ſimple application of two diſſimilar coatings, I mean of two different metals, to ſimilar parts of the animal, and even to two parts very near to each other of any one muſcle, ſhall diſturb the equilibrium of the electric fluid,

fluid, and drawing it from its ſtate of repoſe and inactivity, ſhall induce it to paſs inceſſantly from one part to another; which transflux takes place as ſoon as a communication, by means of the conductor, is formed between theſe two diſſimilar coatings, and continues all the time this communication ſubſiſts. But conceivable or not, and whatever may be the cauſe, it is a fact that the experiments I have already related ſufficiently prove, and which will be confirmed by many others, to the deſcription of which I ſhall endeavour to add ſome explanation. It is a fact, to be added to what we already know in electricity; a fact which muſt ſurely appear extraordinary, and difficult to be reconciled with the laws commonly eſtabliſhed. It is truly a new and very ſingular law, which I have diſcovered; a law that belongs not properly to animal electricity, but to common electricity, ſince this transflux of the electric fluid, a transflux, not momentary, as a diſcharge would be, but which continues as long as the communication between the two coatings ſubſiſts, and takes place whether theſe coatings are applied to living or dead animal ſubſtances, or to other conductors not metallic, but ſufficiently good, as water, or moiſt bodies. But before I proceed to the experiments

periments which decisively prove all that I have advanced, I think it right to offer a few more remarks on those I have already described (Sect. 20—32.).

(34.) It would seem from these that by means of the simple artifice of coatings of different metals suitably applied, we are able to excite very strong convulsions in every muscle of every animal, so long as it continues to possess any degree of vitality. Such a conclusion, however, would be too general, my experiments having taught me that it is to be admitted only with certain restrictions, as well with respect to the classes and genera of animals, as with respect to the different muscles of each animal.

(35.) And first with respect to the different classes of animals; although it has uniformly happened that all the quadrupeds, birds, fishes, reptiles, and amphibious animals, which have been submitted to my experiments, exhibited the phenomena above described, it is no less certain that worms in general, and several species of insects, remained unaffected. I have in vain tried with worms, leeches, snails, oysters, and different caterpillars; I have not even been able to excite the least motion in them by small and moderate sparks, and discharges of artificial

electricity. Here is the manner in which I proceeded.

Experiment I. I applied the tin foil, and ſilver leaf, to different parts, as well external as internal, of theſe ſnails, leeches, earth worms, &c. and in the beſt way I was able; I then formed a communication between theſe metallic coatings, ſometimes by bringing them into contact with each other, and at others by means of another metal that performed the office of a conductor; but by neither of theſe means could I ever obtain the leaſt motion in any part of the body.

Experiment L. I conveyed through their bodies, both when inſulated and not inſulated, diſcharges of a Leyden phial of ſufficient ſtrength to excite a moderate ſpark, and to give me a ſlight ſhock, but they were not ſenſibly affected by it; no motions or convulſions were produced.

(36.) Does it follow from hence that the more imperfect animals, the whole claſs of worms, and ſeveral ſpecies of inſects, are deſtitute of that ſenſibility and irritability, that electrical mobility, if I may be allowed the expreſſion, with which other more perfect animals are endowed? I am unwilling to draw this general concluſion from my experiments, becauſe I have

as

as yet extended them only to a ſmall number of worms and inſects; and with regard to the latter, I think it right to obſerve that I have ſucceeded, without much difficulty, with craw fiſh, beetles, graſshoppers, butterflies, and flies. It may not be uſeleſs that I explain one of the ways in which I ſucceed with theſe animals, as they are with difficulty ſubmitted to experiments, on account of their minuteneſs, or of the ſcales with which they are covered.

Experiment M. After cutting off the head of a fly, a butterfly, beetle, &c. I ſlit open, with a penknife or ſmall ſciſſars, the whole length of the corſlet, and introduce deep into the ſlit, near the neck, a bit of tin foil, (what is improperly called ſilver paper is very fit for this purpoſe) and a little below I introduce, and likewiſe deep into the ſlit, a bit of ſilver plate, or ſmall ſilver coin; and when I bring the latter into contact with the piece of tin foil, the legs begin to bend and tremble, and the other parts, and even the trunk of the animal, are thrown into agitation. It is very amuſing to excite in this manner the chirping of a graſshopper, &c.

(37.) After what I have juſt now ſaid, I ſhould be wrong to rank inſects among the animals that are deſtitute (like the claſs of worms

above mentioned) of the electrical property in queſtion. At the utmoſt, if caterpillars appear to be ſo, it may be ſaid that in this ſtate of larva, before they have attained, by their metamorphoſis, a perfect ſtate, and acquired new organs, &c. they may be compared in many reſpects to worms, and, like theſe, are not endowed with electric ſenſibility.

(38.) In ſhort, if I may be allowed to ſtate here what I think, thoſe animals only that have very diſtinct limbs, with joints, and muſcles fitted for the motion of thoſe joints, or, in other words, muſcles that are called flexors, or levators, and nerves proper to regulate them, ſuch animals only, I ſay, are ſenſible to, and become ſeized with real ſpaſmodic contractions in conſequence of either ſmall diſcharges of artificial electricity, or a weak current of fluid occaſioned ſimply by different metallic coatings; which contractions and ſpaſms bring on the motion, and even a violent agitation of the ſaid limbs. On the contrary, worms, and ſuch inſects as have not ſufficiently diſtinct limbs, or joints properly ſo called, or which are deſtitute of flexor muſcles, or enjoy only a vermicular motion, are nowiſe affected by ſuch an electricity. The motions of theſe animals depend on a different

a different animal œconomy; on a different mechaniſm, which in ſeveral ſpecies has been very well diſcovered and explained. Such are my ideas, ſtill indeed ſomewhat vague, and founded only on a few experiments; it is the ſequel of theſe that muſt either confirm or rectify them.

(39.) With reſpect to different muſcles in the ſame animal, I am able to advance ſomething more certain. I ſay then, that all muſcles are very far from being ſuſceptible of contraction from the weak electricity in queſtion. There is a great diſtinction to be made with regard to their functions in the animal œconomy; all of them are not ſubject to the empire of the will, and fitted for ſpontaneous movements: and, ſtrictly ſpeaking, it is only thoſe which are ſo that are capable of ſpaſmodic contractions by the means above deſcribed; yes, the muſcles ſubject to the will are the only ones I have found ſuſceptible of irritation and motion, by the action of that weak current of electric fluid occaſioned by the ſimple contact of two different metals. The other muſcles, over which the will has no direct power, as thoſe of the ſtomach, inteſtines, &c. are not at all ſo, not even the heart, though in other reſpects ſo irritable. We muſt except, however, the muſcles of the

diaphragm, (and I conjectured it before I made the trial) theſe being of the number of thoſe whoſe motion depends on the will.

Experiment N. It is very ſurpriſing that a ſlice of good muſcular fleſh, cut, for inſtance, from the thigh of a lamb killed half an hour or an hour before; that this piece, I ſay, of muſcle, almoſt quite cold, and which is no longer ſenſible to the action of any mechanical or chemical ſtimulus, ſhould be ſo powerfully affected by the electric fluid conveyed from one part of it to another, as to be ſeized with very ſtrong ſpaſmodic contractions; and that, on the contrary, the heart recently taken out of the ſame animal, and ſtill warm and very irritable, ſhould, when treated in the ſame manner, with the beſt adapted metallic coatings, ſuffer no alteration upon our making a communication between the two metals by means of the conductor; and that its pulſations, when weakened or ſlackened, or altogether ſuſpended, ſhould not be increaſed, or even revived, notwithſtanding all this takes place from the application of the ſlighteſt mechanical or chemical ſtimulus.

(40.) The electric fluid, therefore, which ſeems to be the ſtimulus appropriated to the muſcles of the will, is nowiſe ſo to the heart,

or

or to the other muſcles formed for involuntary vital and animal functions. But what will be ſaid if I make it appear that it is not the immediate or efficient cauſe of motion in the voluntary muſcles; that even in theſe it is a mediate cauſe only, the nerves alone being directly affected by it? And yet this is what I have learned from ſeveral experiments; experiments that have obliged me to give up the fineſt and moſt extenſive ideas I had formed on the ſubject. I was fond of thinking, with Mr. Galvani, that as often as a current of the electric fluid, put in motion in the organs, was impelled with a certain degree of ſtrength to the muſcles, this fluid did itſelf perform the office of a ſtimulant, and excited the irritability which is peculiar to them; that every muſcular movement was executed in conſequence of a ſimilar irruption of electrical fluid into the muſcles, either by means of artificial electricity, or by putting in motion the natural artificial electricity; that, in ſhort, even the motions which are performed naturally in the living animal machine, at leaſt the voluntary motions, acknowledged the ſame cauſe, that is to ſay, the immediate action of the electric fluid on the muſcles. But I repeat it, I have found myſelf obliged, with regret, to

give up all thoſe fine ideas by which it ſeemed poſſible to explain things to admiration. Yes, we muſt conſiderably limit the action of electricity in animals, and conſider it under another point of view, that is to ſay, as being capable of exciting, of itſelf, the nerves, as I have already hinted, and as I ſhall now proceed to prove.

(41.) In the firſt place, then, that it can act, and that it really does act, on the nerves, and that the latter, excited by it, excite in their turn the muſcles connected with them, without even the electrical ſtream's arriving at thoſe muſcles, is a fact which no longer ſtands in need of proofs after thoſe furniſhed by the experiments A. and B. (Sect. 19. and 20.) and even by an experiment of Mr. Galvani, which, according to his account, was the firſt he made, and the origin of all his other experiments. It is ſufficiently obvious that the electric current, in the experiment in queſtion, as well as in thoſe made by me, and which I have juſt now referred to, pervades only a part of the crural nerve, but not one of the muſcles of the leg; and yet as the latter depend on the nerve, they are affected with convulſions.

(42.) But I go farther, and maintain, that even

even in the caſes where the electrical current (it will be clearly underſtood that I am ſpeaking only of weak artificial diſcharges, or of the current which takes place by the ſimple application of coatings of different metals) ſtrikes and penetrates muſcles ſuſceptible of movement, it is not by irritating the latter immediately that it occaſions them to contract, but by ſtimulating their nerves. This is what is ſhown by my experiments C. and D. (Sect. 21. and 23.) where, upon the tin foil and piece of ſilver being applied immediately to the muſcular parts of the animal, whether the animal or only a detached portion of it is the ſubject of the experiment, it is not ſo much the muſcles covered by the two metallic coatings that ſuffer the moſt violent contractions, as thoſe which depend on ſome principal nerve, to which one or other of the coatings is contiguous. It is in this manner that in the frog, when the tin foil is applied on the loins, where the crural nerves lay at but little depth, the muſcles of the legs are ſeized more than any others with ſtrong convulſions, more ſo even than thoſe contiguous to the other coating, that is to ſay, to the piece of ſilver. I have already pointed out the ſame thing in quadrupeds, dogs, lambs, &c. with regard

gard to the iſchiatic nerve, (Experiment D.) and I have only to add, that the leg never fails to be convulſed when this nerve does not lay too deep under the fleſh and other integuments, and one of the coatings is properly applied to this part; even although the other coating ſhould be made to correſpond neither with the gluteus nor any muſcle of the leg, but with any other muſcle whatever, provided it be not at too great a diſtance. Here is another proof why this happens:

Experiment O. If we apply in a frog, or any other ſmall animal, the tin foil the whole length of the ſpine of the back, from which proceed all the nerves of the trunk and limbs, and the other coating to any other part whatever, all the limbs become affected; the muſcles, not only of the legs, but of the belly and back, experience ſpaſmodic contractions, and the trunk itſelf becomes curved; in a word, the convulſions are general. The experiment is ſtill more ſtriking in a lizard than in a frog, and I ſhall therefore deſcribe it.

Experiment P. After cutting off the head of a lizard, and laying bare the muſcles of the back by removing the ſkin, I apply a piece of tin foil to the mutilated end, in ſuch a manner that

that the tin foil is ſpread beyond the edges of the wound, ſo as to riſe a little over the ſhoulders, and I place a piece of money on the middle of the ſpine; this done, I ſlide forward the piece of money till I bring it into contact with the tin foil. At that inſtant the legs move, the tail twiſts itſelf, and the whole body of the animal becomes agitated, and darts from right to left, and from left to right. Is not this becauſe the upper part of the ſpinal marrow, the principal ſource of the nerves, is irritated?

(43.) Nearly the ſame effects may be obtained by a ſimilar operation on a mouſe, a ſmall bird, &c. but in theſe it is neceſſary to remove not only the ſkin and other integuments, but likewiſe ſome of the fleſh, and this becauſe their back being more fleſhy, the principal nerves of the ſpine are more concealed by this fleſh, and by the bones alſo of the vertebral tube. It is in fact eaſy to comprehend that the current of electric fluid, occaſioned by the two coatings, penetrating only to a certain depth the parts of the animal covered by theſe coatings, can hardly reach the ſpinal marrow, or the principal branches of the nerves that enter into the interior parts of the limbs, if the bones, fleſh, and other intervening integuments are of conſiderable

ſiderable thickneſs. The reaſon alſo muſt be obvious, why, in the larger animals, as dogs, lambs, &c. we fail to excite contractions in all the limbs by the application of the two coatings to the back, although ſtripped of its fleſh. The large trunks of the nerves remain ſtill at too great a depth; and it is only the ſmaller branches or ramifications that lay but a little below the coatings, and theſe branches terminate, for the moſt part, only in the neighbouring external parts; conſequently we ſee produced only ſuperficial contractions or palpitations in one or other of the muſcles: or if by chance a whole limb is put in motion, it is becauſe the nerve that goes to it, and influences this motion, is but thinly covered, ſo that only a thin layer of fibres intervenes between it and one or other of the metallic coatings, as appears from Experiment D. and the following ones (Sect. 23. &c.) in which the application of one of the coatings near the iſchiatic nerve, in a dog or a lamb, was ſufficient to excite conſiderable movements in the leg; and the nearer the coating was to the nerve, and the thinner the layer of fleſh was that ſurrounded it, ſo much ſtronger in proportion were the contractions of the limb.

(44.) It becomes therefore neceſſary to know the ſituation of the nerves, their direction, &c.; and it is requiſite to remove not only the common integuments, the fat, &c. but likewiſe part of the fleſh that covers and ſurrounds the nerves, in order that this ſurrounding muſcular ſubſtance may be more or leſs extenuated, previouſly to the application of the metallic coating, to enable us to obtain in the larger animals contractions in any particular limb, to ſay nothing of the ſuperficial contractions and palpitations of one or more muſcles. It is perhaps impoſſible to excite theſe ſame motions and contractions in all the limbs at once; although this is not difficult in the ſmaller animals, as we have already ſeen, (Sect. 42. Experiments O. and P.) merely by depriving them of the ſkin or a part of the other integuments; and even this is not neceſſary in frogs, for in theſe animals we may leave the ſkin, it being ſo extremely thin and moiſt, as not to prevent, by its interpoſition, the electrical current from reaching the principal nerves or the ſpinal marrow.

(45.) But if it be neceſſary to pay attention to the direction of the principal nerves, in order to bring on the contractions in the different limbs, it is not leſs ſo to be careful of the poſition

ſition of the coatings relatively to the muſcles; for thoſe muſcles which are neareſt to one or other of the coatings, are in general the moſt liable to contract ſpaſmodic convulſions, and are oftentimes the only ones in which ſuch an effect takes place; as, for inſtance, when the coatings do not correſpond with any conſiderable nerve, or if there be a nerve, when it is ſurrounded with too much muſcular fleſh, or is too deeply ſeated.

(46.) This, and the Experiments E. F. (Sect. 28.) where a ſingle muſcle, and even a part of a muſcle, treated in the uſual way, experienced very ſtrong contractions, might lead to a ſuppoſition that the electric fluid produces theſe effects by irritating the muſcular fibres themſelves, without the intervention of nerves; the action of which would conſequently be neither *primary*, nor abſolutely neceſſary, as I pretend. But an argument of this ſort, founded on theſe facts, can have no weight, unleſs it could be proved that in theſe muſcles, or portions of muſcles, there are no nerves; for if there are nerves, (and certainly there muſt be, and are, nervous filaments in every ſenſible portion of a muſcle, I had almoſt ſaid in every muſcular fibre) I may ſtill maintain that it is theſe ner-

vous filaments, ramifying through the whole ſubſtance of a muſcle, that are immediately affected by the electric fluid which penetrates this ſame ſubſtance; that this fluid exerting its influence on their nerves, an influence that finiſhes there, the latter exert theirs on the muſcles, &c. I may, I ſay, be able to maintain, with ſufficient probability, that the electric fluid has no other influence, in the phenomenon of muſcular contractions, than that of exciting the nerves; in a word, that it is not the immediate cauſe. Such an aſſertion, which the things already explained render more than probable, is proved directly, and in the moſt obvious manner, by ſeveral experiments I have made on the tongue; experiments that have led me to other diſcoveries equally intereſting and curious.

(47.) Having ſucceeded in exciting tonic convulſions, and the moſt violent motions in the muſcles and limbs, not only of ſmall but of large animals, without laying bare any nerves, by the ſimple application of coatings of different metals to the muſcles when freed from their integuments, I ſoon thought of trying whether the ſame effects might not be obtained in the human body. I conceived that the thing might ſucceed very well in amputated limbs; but in the entire

tire and living ſubject how was it to be effected? It ſeemed likewiſe to be neceſſary to remove the integuments, make deep inciſions, and even diſſect off portions of the fleſh from the parts on which we might think of applying the metallic coatings (as I have remarked we are often obliged to do in the larger animals). Fortunately it came into my head, that we have, in the tongue, a muſcle that is bare, or at leaſt deſtitute of thoſe thick integuments with which the external parts of the body are covered, a muſcle which is extremely moveable, and moveable at will. Here then, I ſaid to myſelf, are all the conditions requiſite to enable us to excite movements by the uſual artifice of different metallic coatings. With this view I made, on my own tongue, the following experiment.

(48.) Experiment Q. Having covered the point of the tongue, and a part of its upper ſurface, to the extent of ſome lines, with a piece of tin foil, (what is called ſilver paper is the fitteſt for the purpoſe) I applied the convex part of a ſilver ſpoon farther on, on the flat part of the tongue, and by inclining the ſpoon downwards brought the handle of it into contact with the tin foil. I expected to ſee my tongue affected with tremor; and on this account

count I made the experiment before a looking-glaſs. The effect, however, I had ventured to foretel did not take place; but inſtead of it I had a ſenſation I nowiſe expected; this was a pretty ſtrong acid taſte on the point of the tongue.

(49.) I was at firſt much ſurpriſed at this; but upon reflecting a little on the fact, I eaſily conceived, that the nerves which terminate on the point of the tongue, being the nerves deſtined for the ſenſations of taſte, and not for the motion of this flexible muſcle, It was perfectly natural, that the irritation of the electric fluid, put in motion by the uſual artifice, ſhould excite a taſte, and nothing more; and that in order to excite in the tongue the motions of which it is ſuſceptible, it would be neceſſary to apply one of the metallic coatings near its root, where the nerves enter that influence its motion; and this I ſoon verified by another experiment, as follows:

(50.) Experiment R. Having cut out, from a lamb recently killed, the tongue near its root, I applied a piece of tin foil at the end that was cut, and the ſilver ſpoon to one of the ſurfaces of the tongue; and then forming a communication between theſe two metallic coat-

ings, I had the pleaſure to ſee the whole tongue affected with tremor, raiſing its point, and turning and bending itſelf in different directions, every time, and as long as ſuch a communication took place.

(51.) I have repeated this experiment on the tongue of a calf, which I placed, coated in the ſame manner with a piece of tin foil near its root, on a ſilver plate, that the latter might ſerve as another coating; and the ſucceſs was the ſame. I have likewiſe repeated it on the tongue of other ſmaller animals, as mice, chicken, rabbits, &c. and I have almoſt always obtained the ſame effect. I ſay *almoſt always*, for in the tongue of the ſmaller animals it ſometimes failed; either becauſe the tin foil was not applied exactly to the proper place, where the nerves that influence the motions of the tongue are inſerted; or becauſe the tongue being cold, had loſt its vitality, which ſeldom laſts long in the muſcles of animals of warm blood, as I have already had occaſion to obſerve (Sect. 26.), and particularly in the tongue.

I am, &c.

A. VOLTA.

October 25, 1792.

XII. *A Return*

XIII. *An Account of a ſingular Caſe of Iſchuria, in a young Woman, which continued for more than three Years; during which Time, if her Urine was not drawn off with the Catheter, ſhe frequently voided it by vomiting; and, for the laſt twenty Months, paſſed much Gravel by the Catheter, as well as by vomiting, when the Uſe of that Inſtrument was omitted, or unſucceſsfully applied. To which are added ſome Remarks and Phyſiological Obſervations. By* Iſaac Senter, *M. D. Aſſociate Member of the College of Phyſicians of Philadelphia, and ſenior Surgeon in the late American Army.* Vide *Tranſactions of the College of Phyſicians, of Philadelphia. Vol.* I. *Part* I. 8vo. Philadelphia, 1793.

THE ſubject of this extraordinary caſe was a healthy-looking ſervant girl, who, in June, 1785, being then in her fifteenth year, was ſeized with a pain in the left hypochondrium, accompanied with cough, oppreſſion at her breaſt, dyſpnœa, and fever.

She had menſtruated pretty regularly from the age of thirteen till within five weeks of her preſent illneſs, which was aſcribed to cold.

Venæſection and other ſuitable remedies were had recourſe to by Dr. Senter, to whom ſhe applied for relief, and her complaints ſoon ſubſided; but about a month afterwards ſhe vomited up a quantity of bloody pus, which induced him to think a vomica had burſt in her ſtomach; for during the whole of this illneſs, her ſtomach, it ſeems, was ſo irritable, that ſhe could with difficulty retain in it either food or medicine.

She had now a ſuppreſſion of urine, which, after continuing twenty-four hours, went off without any medical aſſiſtance. After this ſhe became regular in her menſes, and in about two months was ſufficiently recovered to reſume her employment as a ſervant, which ſhe continued to follow till the 3d of June, 1786, when all her former complaints (except the ſuppreſſion of the menſes) returned with greater ſeverity than before.

Her pulſe was now at 120; her ſtomach, as during the former attack, was ſo irritable, that ſhe vomited up immediately almoſt every thing ſhe took. Of the different remedies that were had recourſe to, opium, when ſhe could retain it on her ſtomach, and repeated blood-letting in ſmall quantities, gave her the moſt relief.

On

On the 2d of July, when the ſeverity of the ſymptoms had ſubſided, ſhe was ſeized with a total ſuppreſſion of urine, which continued till the beginning of the ſixth day, when a vomiting came on, which laſted till ſhe brought up nothing but water; and this water, ſhe ſaid, taſted like urine.

As the vomiting continued ſhe found relief from the ſoreneſs nnd ſwelling ſhe had felt for ſeveral days in the lower part of the abdomen.

She now thought herſelf much better, but the vomiting continued to return, more or leſs, every day, till the 14th of July, when Dr. Senter again ſaw her, and prevailed on her to ſubmit to the introduction of a catheter, by means of which he drew off about three pints of clear, but high-coloured, urine.

From this time, till December, ſhe continued with very little abatement of her complaints; and as ſhe could lie in no other poſition, was conſtantly ſupported in an arm chair, in a reclined poſture, with pillows under her hips.

During the whole of this period, whenever her water was omitted to be drawn off once in thirty or thirty-ſix hours at fartheſt, ſhe never failed, we are aſſured, to vomit it up. To aſ-

certain ſo extraordinary a fact, our author tells us he often viſited her about the time he knew ſhe muſt vomit if the catheter was not introduced; and after examining her bladder, and finding it full, hard, and tender, ſat by her till the vomiting returned, ſaved the water that ſhe brought up in this way, and on comparing it with what he drew off by means of the catheter, found it the ſame in every reſpect.

During the time her urine came off by vomiting, ſhe ſuffered, it ſeems, great anxiety and thirſt, and complained of a ſenſation of inverſion or turning up of ſomething (running, as ſhe expreſſed it) that appeared to tear her bowels.

In January, 1787, from ſome cauſe unknown, ſhe could not be relieved with the inſtrument, nor could ſhe vomit up her urine for ſeveral days; but at length it paſſed by the navel for three days ſucceſſively; after which the catheter was uſed with the ſame effect as before.

About the beginning of Auguſt a brick-coloured gravel began to paſs off through the catheter, and continued to be diſcharged in conſiderable quantity, whenever her urine was drawn off, till the beginning of November; at which time ſhe felt more diſtreſs than uſual, when-

whenever her urine came off by vomiting, and ſhe ſoon obſerved a gritty ſubſtance in her mouth. When our author was informed of this new phenomenon, he requeſted her to ſave the urine for his inſpection the next time ſhe vomited; and on comparing it with what he drew off, found it contained the ſame kind of gravel as that which paſſed the catheter.

From this period, to the ſummer of 1788, her complaints, he obſerves, continued much the ſame; but during that ſummer ſhe twice paſſed a ſmall quantity of urine through the urethra, each time in conſequence of being frightened. The hypogaſtrium became more tumid, and ſhe complained of great foreneſs about the bladder, even after it was evacuated; the bladder itſelf ſeemed to be much thickened, and the apparent inequality of its ſurface was ſo great, and the tumour ſometimes ſhifted ſo towards the right or left inguen, according as her body was moved, that our author ſuſpected the exiſtence of a ſtone.

Through the month of September her urine, we are told, could very rarely be drawn off; for upon the introduction of the catheter, a ſpaſm ſeized the urethra and neck of the bladder, ſo that although the inſtrument ſeemed to

paſs high up into the bladder, not more than a gill of urine could be drawn off, before it ſtopped entirely, with a ſenſation of ſomething falling down againſt the cervix, which ſhe was confident was a ſtone; and early in the following month, Dr. Senter being able to introduce a ſound, readily met with a ſtone, which ſeemed to be of a ſmall ſize, and ſofter than urinary calculi commonly are.

She had at different ſeaſons of the year ſeveral ſmall abſceſſes on different parts of her body, but they did not appear to relieve her general complaints. She alſo voided at times (after ſhe had thrown up her urine) a bloody pus, of a coppery taſte. This purulent diſcharge, it is obſerved, was never expectorated by coughing, though ſhe had at times a dry cough, but was conſtantly brought up by vomiting.

In the ſpring of 1789 her urine began to paſs *per anum*, loaded with the ſame kind of gravel that had come away by the catheter. This diminiſhed but did not put a ſtop to her vomiting; for ſhe continued to throw up more or leſs gravel that way every week. This new courſe of her urine occaſioned a troubleſome diarrhœa and teneſmus, but ſhe felt leſs inconvenience from the ſtone in the bladder.

After

After the 13th of May her bladder never became ſo much diſtended with urine as it had been before; and the ſecretion of urine, as well as the formation of gravel, we are told, evidently diminiſhed in proportion to her loſs of ſtrength, and the increaſe of the diarrhœa. The menſes, which, during the whole of her illneſs, had returned at irregular periods, now entirely ceaſed. During the ſummer, the frequency of vomiting increaſed; ſhe had ſeveral convulſive fits after vomiting; became more and more emaciated, and hectical; and, at laſt, lethargic; and on the 11th of Auguſt, 1789, died.

The body was examined the day after her death, by Dr. Senter, in the preſence of Dr. Waterhouſe, of Cambridge, and Dr. Maſon, of Philadelphia, who, as well as ſeveral other reſpectable medical practitioners, had occaſionally viſited her in her life-time, and ſeen her vomit up both urine and gravel.

On diſſection, nothing was diſcovered that could throw any light on the nature of the diſeaſe.

In the thorax, the only morbid appearance was an adheſion of part of the right lobe of the lungs to the pleura.

In the abdomen, the omentum was found much wafted, and of a dark gangrenous colour; the ſtomach alſo is deſcribed as being in a gangrenous ſtate, and containing 'a ſemi-purulent matter, of a fœtid ſcent;' but the weather, we find, was very warm, and the body in an offenſive ſtate, at the time the diſſection was made. Nothing particularly worthy of notice was obſerved in the ſtate of the liver, gall-bladder, inteſtines, kidneys, or ureters. The urinary bladder was alſo in its natural ſtate, not in the leaſt thickened, and contained no ſand or gravel. The uterus contained about a drachm of thick, fœtid pus, but had no other appearance of diſeaſe; the Fallopian tubes were larger than uſual, and ſtrung with ſeveral hydatids of the ſize of a walnut; the corpora fimbriata had a gangrenous appearance; the ovaria were enlarged to the ſize of a ſmall hen's egg, and diſtended with a clear limpid fluid.

To the preceding hiſtory Dr. Senter has added many judicious remarks; and in his attempt to account for the phenomena of ſo very uncommon a caſe, has not omitted to avail himſelf of the modern doctrine of the retrograde motion of the lymphatics, and of the opinions of thoſe writers who have maintained the

the exiſtence of a direct communication between the alimentary canal and the urinary bladder.

There are many inſtances, he obſerves, in medical books, of ſudden and partially-increaſed actions of the veſſels of the human body; but he candidly acknowledges that his reading has furniſhed him with no fact ſimilar to the extraordinary one which is the ſubject of the paper before us *: that which he conſiders as

* There are, however, upon record, two caſes which exhibit a ſtriking analogy to that of Dr. Senter's patient; and although they may have been overlooked, or perhaps diſregarded on a ſuppoſition of their improbability, they muſt now become extremely intereſting by the tendency they have to corroborate the curious and extraordinary facts he has related. Both the caſes we allude to occur in the Hiſtory of the Academy of Sciences at Paris, and are as follows:

Caſe I. "M. Maraldi has communicated to the Aca-
"demy the following caſe, from a letter addreſſed to him
"by M. Marangoni, phyſician at Mantua:

"A Nun, of the Order of St. Francis, in the convent of
"St. Joſeph, at Mantua. aged thirty-five years, of a thin
"and delicate habit of body, and who had long been ſub-
"ject to hyſterical complaints, was attacked with pains,
"ſpaſms, and ſwelling of the abdomen, to which ſucceeded
"a violent and alarming ſuppreſſion of urine. Soon after
"this ſhe felt a pain, which ſhe deſcribed as aſcending from
"the lower part of the abdomen to her ſtomach; and ſhe
"vomited

as coming the neareſt to it, is a caſe deſcribed by Dr. Percival, in the ſecond volume of his Eſſays, Medical and Experimental, (8vo, London,

" vomited a fluid which, without any difficulty, was " known to be urine. This vomiting continued forty days, " during which time the patient voided no urine by the " uſual channel, unleſs the ſurgeon drew it off with a ca- " theter, and even then the quantity ſcarcely amounted to " an ounce a day. At the end of the forty days, the urine " ſpontaneouſly reſumed its natural courſe, and in a day or " two the patient found herſelf perfectly recovered. But " the vomiting of urine returned, and at the end of twenty- " ſeven days, the patient complained of very acute pain " about the region of the pubis. Her ſurgeon was deſirous " of relieving her by means of the catheter, but there was " ſuch a contraction of the urethra, that he found it impoſ- " ſible to introduce even a probe into the bladder. The " vomiting of urine has continued, and what is remarka- " ble, there is no appearance of food mixed with it, even " when the vomiting takes place ſoon after her meals. " When M. Marangoni wrote this account, the patient had " been in this ſtate thirty-two days.

" This ſingular complaint would lead one to think there " is an immediate though hitherto undiſcovered commu- " nication between the ſtomach and the urinary bladder; " but M. Marangoni and the celebrated Lanciſi are of a " different opinion; they both of them think, that in caſes " of this kind a ſuppreſſion of urine takes place in the kid- " neys; that is to ſay, that the kidneys ceaſe to extract this " fluid

London, 1773) of a woman who, after a ſpontaneous vomiting of ſeveral days, during which ſhe brought up three gallons of water, was entirely cured of a dropſy of the ovarium.

" fluid from the blood, and that in their ſtead the glands of " the ſtomach perform this function."

Caſe II. " M. Lemery is acquainted with a Monk, who, " for about eight years, has been ſubject to a periodical vo- " miting, the fits of which are as regular as thoſe of a quar- " tan ague. Five hours, or thereabouts, before the vomit- " ing begins he complains of violent pains in his kidneys. " The vomiting continues, with intervals, four or five " hours. What he vomits is of a dirty red colour. It is " almoſt entirely water, but has a ſtrong urinous ſmell, and " the patient has no doubt of its being really urine, as he " eats but very little, and drinks more than the uſual portion " of a Monk. He drinks only wine, the colour of which " agrees with that of the fluid he vomits. A few hours " after the vomiting he finds himſelf well, and remains ſo " till the next fit. He uſes a great deal of exerciſe, with- " out which he thinks he ſhould ſuffer more. It is a known " fact, that in nephritic pains, which are always occaſioned " by obſtructions of the kidneys, the patients are ſubject to " frequent vomiting, and that what they bring up ſmells " much of urine."——*See* Hiſtoire de l'Academie Royale des Sciences, Année 1715 & 1722." EDITOR.

CATALOGUE

CATALOGUE OF BOOKS.

1. THOUGHTS on the Effects of the Application and Abſtraction of Stimuli on the Human Body; with a particular View to explain the Nature and Cure of Typhus. By *J. Wood*, M. D. 8vo. *Murray*, London, 1793.

2. An Account of the Bilious, Remitting, Yellow Fever, as it appeared in the City of Philadelphia in the year 1793. By *Benjamin Ruſh*, M. D. 8vo. Philadelphia, 1794.

3. Obſervations on the Cauſe, Nature, and Treatment of the Epidemic Diſorder prevalent in Philadelphia. By *D. Naſſy*, M. D. Member of the American Philoſophical Society. 8vo. Philadelphia, 1793.

4. A Short Account of the Malignant Fever, lately prevalent in Philadelphia; with a Statement of the Proceedings that took place on the Subject in different Parts of the United States. By *Matthew Carey*. 8vo. Philadelphia, 1793.

5. A Treatiſe on the Extraction of the Cataract. By *Frederick Biſchoff*, F. M. S. Oculiſt to his Majeſty in the Electorate of Hanover,

and to her Majeſty in England. 8vo. *Nicol*, London, 1793.

6. An Account of a Fever which appeared in ſeveral Parts of Somerſetſhire in the year 1792. By *Richard Poole*, Surgeon, Sherborne. 8vo. *Johnſon*, London, 1793.

7. A Guide for Self-Preſervation and Parental Affection; or plain Directions for enabling People to keep themſelves and their Children free from ſeveral common Diſorders. By *Thomas Beddoes*, M. D. 12mo. *Murray*, London, 1793.

8. A Chemical Diſſertation on the Thermal Waters of Piſa, and on the neighbouring acidulous Spring of Aſciano; with an Hiſtorical Sketch of Piſa, and a Meteorological Account of its Weather. To which are added, Analytical Papers reſpecting the Sulphureous Water of Yverdun. By *John Nott*, M. D. of Briſtol Hot-wells. 8vo. *Walter*, London, 1793.

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10. Flora Oxonienſis, exhibens Plantas in agro Oxonienſi ſponte creſcentes, ſecundum Syſtema ſexuale diſtributas. Auctore *Joanne Sibthorp*, M. D. Profeſſore Regio Botanico, Regiæ Societatis Londinenſis aliarumque Societatum Socio. 8vo. Oxonii, 1794.

11. Diſſer-

11. Dissertatio Inauguralis de Angina maligna. Auctore *Arthuro Bedford*, Anglo. 8vo. Edinburgi, 1792.

12. Dissertatio Inauguralis de Respiratione. Auctore *Thoma Blair*, Scoto-Britanno. 8vo. Edin. 1792.

13. Dissertatio Inauguralis de Variolis. Auctore *Joanne Bower*, Scoto. 8vo. Edin. 1792.

14. Dissertatio Inauguralis de Visu. Auctore *Wheaton Bradish*, Hiberno. 8vo. Edin. 1792.

15. Dissertatio Inauguralis de Rheumatismo acuto. Auctore *Joanne Bradley*, Anglo. 8vo. Edin. 1792.

16. Dissertatio Inauguralis de Cœli Effectibus. Auctore *Jacobo Buchan*, Scoto. 8vo. Edin. 1792.

17 Dissertatio Inauguralis de Rheumatismo acuto. Auctore *Andrea Grieve*, Scoto. 8vo. Edin. 1792.

18. Dissertatio Inauguralis de Hypochondriasi. Auctore *David Corbin Kerr*, Virginiense. 8vo. Edin. 1792.

19. Dissertatio Inauguralis de Variolis. Auctore *Gulielmo Marsden*, Anglo-Britanno. 8vo. Edin. 1792.

20. Dissertatio Inauguralis de Pneumonia.

Auctore *Carolo Merivether*, Virginienſe. 8vo. Edin. 1792.

21. Diſſertatio Inauguralis de Variolis. Auctore *Roberto Montgomery*, Hiberno. 8vo. Edin. 1792.

22. Diſſertatio Inauguralis de Hydrope Anaſarca. Auctore *Thoma Pollard Pierce*, Barbadenſe. 8vo. Edin. 1792.

23. Diſſertatio Inauguralis de Angina maligna. Auctore *Georgio Wier*, Scoto. 8vo Edin. 1792.

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25. Diſſertatio Inauguralis de Coitu ejuſque variis Formis quatenus Medicorum ſunt. Auctore *Johanne Paul Gottleib Kircheiſen*. 4to. Jena, 1792.

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27. Memoire ſur une Maladie de l'Ovaire. Par *Jean Baptiſte Ph. R. N. Laumonier*, Chirurgien en chef de l'Hotel Dieu de Rouen. 4to. Rouen, 1790.

28. Avis aux Sages Femmes; par M. *Sacombe*,

Medecin-Accoucheur, Membre de plusieurs Academies. 8vo. Paris, 1792.

29. Recherches Physico-chymiques. Cahiers I. II. III. 4to. Amsterdam, 1793-4.

30. Memoires de l'Academie Royale des Sciences et Belles Lettres depuis l'Avenement de Frederic Guillaume II. au Trone. 1788 et 1789. Avec l'Histoire pour le même Tems. 4to. Berlin, 1793.

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32. Memoria Chirurgica sul Labbro leporino complicato; di *Giuseppe Sonsis*, R. Assess. Medico, &c. 4to. Cremona, 1793.

33. Pisaura Automorpha e Coreopsis formosa; Piante nuove pubblicate da *Giuseppe Antonio Bonato*, Dott. di Medicina, pubblico Bibliotecario, Ispettore e Soprantendente all' Orto medico dell' Universita di Padova. 4to. Padova, 1793.

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